Annex A (normative):  
Measurement channels

# A.1 General

## A.1.1 Throughput definition

The throughput values defined in the measurement channels specified in Annex A, are calculated and are valid per codeword. For multi-codeword transmissions, the throughput referenced in the minimum requirements is the sum of throughputs of all codewords.

## A.1.2 TDD UL-DL configurations for FR1

TDD UL-DL configurations for performance requirements are provided in Tables A.1.2-1, A.1.2-2, and A.1.2-3.

Table A.1.2-1: TDD UL-DL configuration for SCS 15 kHz

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | UL-DL pattern |
| FR1.15-1 |
| TDD Slot Configuration pattern (Note 1) | |  | DDDSU |
| Special Slot Configuration (Note 2) | |  | 10D+2G+2U |
| *referenceSubcarrierSpacing* | | kHz | 15 |
| pattern1 | *dl-UL-TransmissionPeriodicity* | ms | 5 |
| *nrofDownlinkSlots* |  | 3 |
| *nrofDownlinkSymbols* |  | 10 |
| *nrofUplinkSlot* |  | 1 |
| *nrofUplinkSymbols* |  | 2 |
| The number of slots between PDSCH and corresponding HARQ-ACK information (Note 3) | |  | 4 if mod(i,5) = 0 3 if mod(i,5) = 1 2 if mod(i,5) = 2 6 if mod(i,5) = 3 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index per frame; i = {0,…,9}. | | | |

Table A.1.2-2: TDD UL-DL configuration for SCS 30 kHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | UL-DL pattern | | | | | |
| FR1.30-1 | FR1.30-2 | FR1.30-3 | FR1.30-4 | FR1.30-5 | FR1.30-6 |
| TDD Slot Configuration pattern (Note 1) | |  | 7DS2U | DDDSU | DDDSUDDSUU | DDDSUUDDDD | DSUU | DS1S2U |
| Special Slot Configuration (Note 2) | |  | 6D+4G+4U | 10D+2G+2U | 10D+2G+2U | 6D+4G+4U | 12D+2G | S1: 10D+2G+2U S2: 12D+2G+0U |
| *referenceSubcarrierSpacing* | | kHz | 30 | 30 | 30 | 30 | 30 | 30 |
| pattern1 |  |  |  |  |  |  |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | 5 | 2.5 | 2.5 | 3 | 2 | 1 |
| *nrofDownlinkSlots* |  | 7 | 3 | 3 | 3 | 1 | 1 |
| *nrofDownlinkSymbols* |  | 6 | 10 | 10 | 6 | 12 | 10 |
| *nrofUplinkSlot* |  | 2 | 1 | 1 | 2 | 2 | 0 |
| *nrofUplinkSymbols* |  | 4 | 2 | 2 | 4 | 0 | 2 |
| pattern2 |  |  |  |  |  |  |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | N/A | N/A | 2.5 | 2 | N/A | 1 |
| *nrofDownlinkSlots* |  | N/A | N/A | 2 | 4 | N/A | 0 |
| *nrofDownlinkSymbols* |  | N/A | N/A | 10 | 0 | N/A | 12 |
| *nrofUplinkSlot* |  | N/A | N/A | 2 | 0 | N/A | 1 |
| *nrofUplinkSymbols* |  | N/A | N/A | 2 | 0 | N/A | 0 |
| The number of slots between PDSCH and corresponding HARQ-ACK information (Note 3) | |  | 8 if mod(i,10) = 0 7 if mod(i,10) = 1 6 if mod(i,10) = 2 5 if mod(i,10) = 3 5 if mod(i,10) = 4 4 if mod(i,10) = 5 3 if mod(i,10) = 6 2 if mod(i,10) = 7 | 4 if mod(i,5) = 0 3 if mod(i,5) = 1 2 if mod(i,5) = 2 6 if mod(i,5) = 3 | 4 if mod(i,10) = 0 3 if mod(i,10) = 1 2 if mod(i,10) = 2 5 if mod(i,10) = 3 3 if mod(i,10) = 5 3 if mod(i,10) = 6 2 if mod(i,10) = 7 | 5 if mod(i,10) = 0 4 if mod(i,10) = 1 3 if mod(i,10) = 2 2 if mod(i,10) = 3 8 if mod(i,10) = 6 7 if mod(i,10) = 7 6 if mod(i,10) = 8 5 if mod(i,10) = 9 | 3 if mod(i,4) = 0 2 if mod(i,4) = 1 | 3 if mod(i,4) = 0 2 if mod(i,4) = 1 3 if mod(i,4) = 2 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index per frame; i = {0,…,19} | | | | | | | | |

Table A.1.2-2a: TDD UL-DL configuration for SCS 30 kHz for DCI-based dynamic UL/DL detection

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | UL-DL pattern |
| FR1.30-1A |
| TDD Slot Configuration pattern (Note 1) | |  | 7DS2U |
| Special Slot Configuration (Note 2) | |  | 6D+4G+4U |
| *referenceSubcarrierSpacing* | | kHz | N/A |
| pattern1 (Note 4) |  |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | N/A |
| *nrofDownlinkSlots* |  | N/A |
| *nrofDownlinkSymbols* |  | N/A |
| *nrofUplinkSlot* |  | N/A |
| *nrofUplinkSymbols* |  | N/A |
|  |  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| PDCCH DCI Configuration | DCI Format |  | 1-1 for slot indices with mod(i,10) = 0,1,2,3,4,5,6,7 |
| Scheduled Grant |  | Symbol 2-13 for slot indices with mod(i,10) = 0,1,2,3,4,5,6 and Symbol 2-5 for slot indices with mod(i,10) = 7 |
| The number of slots between PDSCH and corresponding HARQ-ACK information (Note 3) (PDSCH-to-HARQ-timing-indicator) | |  | 8 if mod(i,10) = 0 7 if mod(i,10) = 1 6 if mod(i,10) = 2 5 if mod(i,10) = 3 5 if mod(i,10) = 4 4 if mod(i,10) = 5 3 if mod(i,10) = 6 2 if mod(i,10) = 7 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G and U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index per frame; i = {0,…,19}  Note 4: Do not configure *tdd-UL-DL-ConfigurationCommon* using RRC configuration. | | | |

Table A.1.2-2b: TDD UL-DL configuration for SCS 30 kHz for PDSCH on band with shared spectrum access

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | UL-DL pattern |
| FR1.30-7 |
| TDD Slot Configuration pattern (Note 1) | |  | 7DS2U |
| Special Slot Configuration (Note 2) | |  | 6D+4G+4U |
| *referenceSubcarrierSpacing* | | kHz | 30 |
| *Pattern 1* | *dl-UL-TransmissionPeriodicity* | ms | 5 |
| *nrofDownlinkSlots* | slot | 7 |
| *nrofDownlinkSymbols* | symbol | 6 |
| *nrofUplinkSlot* | slot | 2 |
| *nrofUplinkSymbols* | symbol | 4 |
| *Pattern 2* | *dl-UL-TransmissionPeriodicity* | ms | N/A |
| *nrofDownlinkSlots* |  | N/A |
| *nrofDownlinkSymbols* |  | N/A |
| *nrofUplinkSlot* |  | N/A |
| *nrofUplinkSymbols* |  | N/A |
| The number of slots between PDSCH and corresponding HARQ-ACK information (Note 3) | |  | 8 if mod(i,10) = 0 7 if mod(i,10) = 1 6 if mod(i,10) = 2 5 if mod(i,10) = 3 4 if mod(i,10) = 4 3 if mod(i,10) = 5 2 if mod(i,10) = 6 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index of all slots in every 5ms i = {0,…,9}Note 4: The slot i, mod (i,10)=9 is idle slot with no UL transmission. | | | |

## A.1.3 TDD UL-DL configurations for FR2

TDD UL-DL configurations for performance requirements are provided in Tables A.1.3-1, A.1.3-2.

Table A.1.3-1: TDD UL-DL configuration for SCS 60 kHz

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | UL-DL pattern |
| FR2.60-1 |
| TDD Slot Configuration pattern (Note 1) | |  | DDSU |
| Special Slot Configuration (Note 2) | |  | 11D+3G+0U |
| *referenceSubcarrierSpacing* | | kHz | 60 |
| pattern1 | *dl-UL-TransmissionPeriodicity* | ms | 1 |
| *nrofDownlinkSlots* |  | 2 |
| *nrofDownlinkSymbols* |  | 11 |
| *nrofUplinkSlot* |  | 1 |
| *nrofUplinkSymbols* |  | 0 |
| The number of slots between PDSCH and corresponding HARQ-ACK information (Note 3) | |  | 3 if mod(i,4) = 0 2 if mod(i,4) = 1 5 if mod(i,4) = 2 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index per frame; i = {0,…,39} | | | |

Table A.1.3-2: TDD UL-DL configuration for SCS 120 kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | UL-DL pattern | |
| FR2.120-1 | FR2.120-2 |
| TDD Slot Configuration pattern (Note 1) | |  | DDDSU | DDSU |
| Special Slot Configuration (Note 2) | |  | 10D+2G+2U | 11D+3G+0U |
| *referenceSubcarrierSpacing* | | kHz | 120 | 120 |
| pattern1 | *dl-UL-TransmissionPeriodicity* | ms | 0.625 | 0.5 |
| *nrofDownlinkSlots* |  | 3 | 2 |
| *nrofDownlinkSymbols* |  | 10 | 11 |
| *nrofUplinkSlot* |  | 1 | 1 |
| *nrofUplinkSymbols* |  | 2 | 0 |
| The number of slots between PDSCH and corresponding HARQ-ACK information(Note 3) | |  | 4 if mod(i,5) = 0 3 if mod(i,5) = 1 2 if mod(i,5) = 2 6 if mod(i,5) = 3 | 3 if mod(i,4) = 0 2 if mod(i,4) = 1 5 if mod(i,4) = 2 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index per frame; i = {0,…,79} | | | | |

Table A.1.3-2a: TDD UL-DL configuration for SCS 120 kHz for DCI-based dynamic UL/DL detection

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | UL-DL pattern |
| FR2.120-1A |
| TDD Slot Configuration pattern (Note 1) | |  | DDDSU |
| Special Slot Configuration (Note 2) | |  | 10D+2G+2U |
| *referenceSubcarrierSpacing* | | kHz | N/A |
| pattern1 (Note 4) | *dl-UL-TransmissionPeriodicity* | ms | N/A |
| *nrofDownlinkSlots* |  | N/A |
| *nrofDownlinkSymbols* |  | N/A |
| *nrofUplinkSlot* |  | N/A |
| *nrofUplinkSymbols* |  | N/A |
|  |  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| PDCCH DCI Configuration | DCI Format |  | 1-1 for slot indices with mod(i,5) = 0,1,2,3 |
| Scheduled Grant |  | Symbol 1-13 for slot indices with mod(i,5) = 0,1,2 and Symbol 1-9 for slot indices with mod(i,5) = 3 |
| The number of slots between PDSCH and corresponding HARQ-ACK information(Note 3) | |  | 4 if mod(i,5) = 0 3 if mod(i,5) = 1 2 if mod(i,5) = 2 6 if mod(i,5) = 3 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G and U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index per frame; i = {0,…,79}  Note 4: Do not configure *tdd-UL-DL-ConfigurationCommon* using RRC configuration. | | | |

# A.2 UL Reference measurement channels

## A.2.1 General

The measurement channels in the following subclauses are defined to test the performance requirements where PUSCH is required. The measurement channels represent example configurations of physical channels for different data rates.

## A.2.2 Reference measurement channels for FDD

### A.2.2.1 RMC for Sustained downlink data rate

#### A.2.2.1.1 CP-OFDM 64QAM

Table A.2.2.1.1-1: Reference Channels for CP-OFDM 64QAM for 15kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | CP-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 15 | 25 | 11 | 64QAM | 19 | 1/2 | 9992 | 24 | 1 | 2 | 19800 | 3300 |
|  | 10 | 15 | 52 | 11 | 64QAM | 19 | 1/2 | 21000 | 24 | 1 | 3 | 41184 | 6864 |
|  | 15 | 15 | 79 | 11 | 64QAM | 19 | 1/2 | 31752 | 24 | 1 | 4 | 62568 | 10428 |
|  | 20 | 15 | 106 | 11 | 64QAM | 19 | 1/2 | 42016 | 24 | 1 | 5 | 83952 | 13992 |
|  | 25 | 15 | 133 | 11 | 64QAM | 19 | 1/2 | 53288 | 24 | 1 | 7 | 105336 | 17556 |
|  | 30 | 15 | 160 | 11 | 64QAM | 19 | 1/2 | 63528 | 24 | 1 | 8 | 126720 | 21120 |
|  | 40 | 15 | 216 | 11 | 64QAM | 19 | 1/2 | 86040 | 24 | 1 | 11 | 171072 | 28512 |
|  | 50 | 15 | 270 | 11 | 64QAM | 19 | 1/2 | 108552 | 24 | 1 | 13 | 213840 | 35640 |
| Note 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM’ed] with PUSCH data.  Note 2: MCS Index is based on MCS table 5.1.3.1-1 defined in TS 38.214 [12].  Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | |

Table A.2.2.1.1-2: Reference Channels for CP-OFDM 64QAM for 30kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | CP-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 30 | 11 | 11 | 64QAM | 19 | 1/2 | 4352 | 24 | 1 | 1 | 8712 | 1452 |
|  | 10 | 30 | 24 | 11 | 64QAM | 19 | 1/2 | 9480 | 24 | 1 | 2 | 19008 | 3168 |
|  | 15 | 30 | 38 | 11 | 64QAM | 19 | 1/2 | 15112 | 24 | 1 | 2 | 30096 | 5016 |
|  | 20 | 30 | 51 | 11 | 64QAM | 19 | 1/2 | 20496 | 24 | 1 | 3 | 40392 | 6732 |
|  | 25 | 30 | 65 | 11 | 64QAM | 19 | 1/2 | 26120 | 24 | 1 | 4 | 51480 | 8580 |
|  | 30 | 30 | 78 | 11 | 64QAM | 19 | 1/2 | 31240 | 24 | 1 | 4 | 61776 | 10296 |
|  | 40 | 30 | 106 | 11 | 64QAM | 19 | 1/2 | 42016 | 24 | 1 | 5 | 83952 | 13992 |
|  | 50 | 30 | 133 | 11 | 64QAM | 19 | 1/2 | 53288 | 24 | 1 | 7 | 105336 | 17556 |
|  | 60 | 30 | 162 | 11 | 64QAM | 19 | 1/2 | 64552 | 24 | 1 | 8 | 128304 | 21384 |
|  | 80 | 30 | 217 | 11 | 64QAM | 19 | 1/2 | 86040 | 24 | 1 | 11 | 171864 | 28644 |
|  | 90 | 30 | 245 | 11 | 64QAM | 19 | 1/2 | 98376 | 24 | 1 | 12 | 194040 | 32340 |
|  | 100 | 30 | 273 | 11 | 64QAM | 19 | 1/2 | 108552 | 24 | 1 | 13 | 216216 | 36036 |
| Note 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM’ed] with PUSCH data.  Note 2: MCS Index is based on MCS table 5.1.3.1-1 defined in TS 38.214 [12].  Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | |

## A.2.3 Reference measurement channels for TDD

### A.2.3.1 RMC for Sustained downlink data rate

#### A.2.3.1.1 CP-OFDM 16QAM

Table A.2.3.1.1-1: Reference Channels for CP-OFDM 16QAM for 15kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | CP-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for slots 4 and 9 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 4 and 9 (Note 3) | Total number of bits per slot for slots 4 and 9 | Total modulated symbols per slot for slots 4 and 9 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 5 | 15 | 13 | 11 | 16QAM | 10 | 1/3 | 2280 | 16 | 2 | 1 | 6864 | 1716 |
|  | 5 | 15 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 10 | 15 | 26 | 11 | 16QAM | 10 | 1/3 | 4480 | 24 | 1 | 1 | 13728 | 3432 |
|  | 10 | 15 | 52 | 11 | 16QAM | 10 | 1/3 | 9224 | 24 | 1 | 2 | 27456 | 6864 |
|  | 15 | 15 | 40 | 11 | 16QAM | 10 | 1/3 | 7040 | 24 | 1 | 1 | 21120 | 5280 |
|  | 15 | 15 | 79 | 11 | 16QAM | 10 | 1/3 | 13832 | 24 | 1 | 2 | 41712 | 10428 |
|  | 20 | 15 | 53 | 11 | 16QAM | 10 | 1/3 | 9224 | 24 | 1 | 2 | 27984 | 6996 |
|  | 20 | 15 | 106 | 11 | 16QAM | 10 | 1/3 | 18432 | 24 | 1 | 3 | 55968 | 13992 |
|  | 25 | 15 | 67 | 11 | 16QAM | 10 | 1/3 | 11784 | 24 | 1 | 2 | 35376 | 8844 |
|  | 25 | 15 | 133 | 11 | 16QAM | 10 | 1/3 | 23040 | 24 | 1 | 3 | 70224 | 17556 |
|  | 30 | 15 | 80 | 11 | 16QAM | 10 | 1/3 | 14088 | 24 | 1 | 2 | 42240 | 10560 |
|  | 30 | 15 | 160 | 11 | 16QAM | 10 | 1/3 | 28168 | 24 | 1 | 4 | 84480 | 21120 |
|  | 40 | 15 | 108 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 57024 | 14256 |
|  | 40 | 15 | 216 | 11 | 16QAM | 10 | 1/3 | 37896 | 24 | 1 | 5 | 114048 | 28512 |
|  | 50 | 15 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
|  | 50 | 15 | 270 | 11 | 16QAM | 10 | 1/3 | 47112 | 24 | 1 | 6 | 142560 | 35640 |
| Note 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM’ed] with PUSCH data.  Note 2: MCS Index is based on MCS table 5.1.3.1-1 defined in TS 38.214 [12].  Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | |

Table A.2.3.1.1-2: Reference Channels for CP-OFDM 16QAM for 30kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | CP-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for slots 8, 9, 18 and 19 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 8, 9, 18 and 19 (Note 3) | Total number of bits per slot for slots 8, 9, 18 and 19 | Total modulated symbols per slot for slots 8, 9, 18 and 19 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 30 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 5 | 30 | 6 | 11 | 16QAM | 10 | 1/3 | 1064 | 16 | 2 | 1 | 3168 | 792 |
|  | 5 | 30 | 11 | 11 | 16QAM | 10 | 1/3 | 1928 | 16 | 2 | 1 | 5808 | 1452 |
|  | 10 | 30 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 10 | 30 | 24 | 11 | 16QAM | 10 | 1/3 | 4224 | 24 | 1 | 1 | 12672 | 3168 |
|  | 15 | 30 | 19 | 11 | 16QAM | 10 | 1/3 | 3368 | 16 | 2 | 1 | 10032 | 2508 |
|  | 15 | 30 | 38 | 11 | 16QAM | 10 | 1/3 | 6656 | 24 | 1 | 1 | 20064 | 5016 |
|  | 20 | 30 | 26 | 11 | 16QAM | 10 | 1/3 | 4480 | 24 | 1 | 1 | 13728 | 3432 |
|  | 20 | 30 | 51 | 11 | 16QAM | 10 | 1/3 | 8968 | 24 | 1 | 2 | 26928 | 6732 |
|  | 25 | 30 | 33 | 11 | 16QAM | 10 | 1/3 | 5760 | 24 | 1 | 1 | 17424 | 4356 |
|  | 25 | 30 | 65 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 34320 | 8580 |
|  | 30 | 30 | 39 | 11 | 16QAM | 10 | 1/3 | 6784 | 24 | 1 | 1 | 20592 | 5148 |
|  | 30 | 30 | 78 | 11 | 16QAM | 10 | 1/3 | 13576 | 24 | 1 | 2 | 41184 | 10296 |
|  | 40 | 30 | 53 | 11 | 16QAM | 10 | 1/3 | 9224 | 24 | 1 | 2 | 27984 | 6996 |
|  | 40 | 30 | 106 | 11 | 16QAM | 10 | 1/3 | 18432 | 24 | 1 | 3 | 55968 | 13992 |
|  | 50 | 30 | 67 | 11 | 16QAM | 10 | 1/3 | 11784 | 24 | 1 | 2 | 35376 | 8844 |
|  | 50 | 30 | 133 | 11 | 16QAM | 10 | 1/3 | 23040 | 24 | 1 | 3 | 70224 | 17556 |
|  | 60 | 30 | 81 | 11 | 16QAM | 10 | 1/3 | 14088 | 24 | 1 | 2 | 42768 | 10692 |
|  | 60 | 30 | 162 | 11 | 16QAM | 10 | 1/3 | 28168 | 24 | 1 | 4 | 85536 | 21384 |
|  | 80 | 30 | 109 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 57552 | 14388 |
|  | 80 | 30 | 217 | 11 | 16QAM | 10 | 1/3 | 37896 | 24 | 1 | 5 | 114576 | 28644 |
|  | 90 | 30 | 123 | 11 | 16QAM | 10 | 1/3 | 21504 | 24 | 1 | 3 | 64944 | 16236 |
|  | 90 | 30 | 245 | 11 | 16QAM | 10 | 1/3 | 43032 | 24 | 1 | 6 | 129360 | 32340 |
|  | 100 | 30 | 137 | 11 | 16QAM | 10 | 1/3 | 24072 | 24 | 1 | 3 | 72336 | 18084 |
|  | 100 | 30 | 273 | 11 | 16QAM | 10 | 1/3 | 48168 | 24 | 1 | 6 | 144144 | 36036 |
| Note 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM’ed] with PUSCH data.  Note 2: MCS Index is based on MCS table 5.1.3.1-1 defined in TS 38.214 [12].  Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | |

# A.3 DL reference measurement channels

## A.3.1 General

The transport block size (TBS) determination procedure is described in clause 5.1.3.2 of TS 38.214 [12].

Unless otherwise stated, no user data is scheduled on slot #0 within 20 ms in order to avoid SSB and PDSCH transmissions in one slot and simplify test configuration.

Unless otherwise stated, SIB1 transmission shall only be scheduled during call setup to avoid SIB1 and PDSCH transmissions in the same slot.

## A.3.2 Reference measurement channels for PDSCH performance requirements

For PDSCH reference channels if more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

### A.3.2.1 FDD

#### A.3.2.1.1 Reference measurement channels for SCS 15 kHz FR1

Table A.3.2.1.1-1: PDSCH Reference Channel for FDD (QPSK)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-1.1 FDD | R.PDSCH.1-1.2 FDD | R.PDSCH.1-1.3 FDD | R.PDSCH.1-1.4 FDD |  |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 |  |
| Number of allocated resource blocks | PRBs | 52 | 6 | 52 | 52 |  |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 7 | 12 |  |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 |  |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAMLowSE |  |
| MCS index |  | 4 | 4 | 4 | 14 |  |
| Modulation |  | QPSK | QPSK | QPSK | QPSK |  |
| Target Coding Rate |  | 0.30 | 0.30 | 0.30 | 0.59 |  |
| Number of MIMO layers |  | 1 | 1 | 1 | 1 |  |
| Number of DMRS REs |  | 18 | 12 | 12 | 12 |  |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | Bits | 3904 | 480 | 2280 | 8064 |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | Bits | 24 | 16 | 16 | 24 |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | CBs | 1 | 1 | 1 | 1 |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 10, 11 | Bits | 12480 | 1512 | 6864 | 13104 |  |
| For Slots i = 1,…, 9, 12, …, 19 | Bits | 13104 | 1584 | 7488 | 13728 |  |
| Max. Throughput averaged over 2 frames | Mbps | 3.709 | 0.456 | 2.166 | 7.661 |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.1.1-2: PDSCH Reference Channel for FDD (16QAM)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.PDSCH.1-2.1 FDD | R.PDSCH.1-2.2 FDD | R.PDSCH.1-2.3 FDD | R.PDSCH.1-2.4 FDD | R.PDSCH.1-2.5 FDD | R.PDSCH.1-2.6 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | 10 |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 | 15 |
| Number of allocated resource blocks | PRBs | 52 | 52 | 52 | 52 | 52 | 52 |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 | 19 | 19 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAMLowSE | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 | 19 | 16 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 | 0.54 | 0.64 |
| Number of MIMO layers |  | 1 | 2 | 3 | 4 | 2 | 1 |
| Number of DMRS REs |  | 12 | 12 | 24 | 24 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 13064 | 26120 | 35856 | 48168 | 29704 | 17424 |
| Transport block CRC per Slot |  |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | CBs | 2 | 4 | 5 | 6 | 4 | 3 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 10, 11 | Bits | 26208 | 52416 | 71136 | 94848 | 49920 | 26208 |
| For Slots i = 1,…, 9, 12, …, 19 | Bits | 27456 | 54912 | 74880 | 99840 | 54912 | 27456 |
| Max. Throughput averaged over 2 frames | Mbps | 12.411 | 24.814 | 34.063 | 45.760 | 28.219 | 16.553 |
| NOTE 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  NOTE 2: Slot i is slot index per 2 frames. | | | | | | | |

Table A.3.2.1.1-3: PDSCH Reference Channel for FDD (64QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-3.1 FDD | R.PDSCH.1-3.2 FDD | R.PDSCH.1-3.3 FDD | R.PDSCH.1-3.4 FDD | R.PDSCH.1-3.5 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 |
| Number of allocated resource blocks | PRBs | 52 | 52 | 26 (Note 3) | 26 (Note 4) | 52 |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 | 19 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 19 | 19 | 19 | 19 | 19 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 1 |
| Number of DMRS REs |  | 12 | 24 | 24 | 24 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 42016 | 37896 | 18960 | 18960 | 21000 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | CBs | 5 | 5 | 3 | 3 | 3 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 10, 11 | Bits | 78624 | 67392 | 33696 | 33696 | 39312 |
| For Slots i = 1,…, 9, 12, …, 19 | Bits | 82368 | 74880 | 37440 | 37440 | 41184 |
| Max. Throughput averaged over 2 frames | Mbps | 39.915 | 36.001 | 18.012 | 18.012 | 19.950 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: PDSCH is scheduled in PRB numbers from 0 to 25.  Note 4: PDSCH is scheduled in PRB numbers from 26 to 51. | | | | | | |

Table A.3.2.1.1-4: PDSCH Reference Channel for FDD (256QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-4.1 FDD | R.PDSCH.1-4.2 FDD |  |  |  |
| Channel bandwidth | MHz | 10 | 10 |  |  |  |
| Subcarrier spacing | kHz | 15 | 15 |  |  |  |
| Number of allocated resource blocks | PRBs | 52 | 52 |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 | 12 |  |  |  |
| Allocated slots per 2 frames | Slots | 19 | 19 |  |  |  |
| MCS table |  | 256QAM | 256QAM |  |  |  |
| MCS index |  | 24 | 20 |  |  |  |
| Modulation |  | 256QAM | 256QAM |  |  |  |
| Target Coding Rate |  | 0.82 | 0.67 |  |  |  |
| Number of MIMO layers |  | 1 | 1 |  |  |  |
| Number of DMRS REs |  | 12 | 12 |  |  |  |
| Overhead for TBS determination |  | 0 | 0 |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A |  |  |  |
| For Slots i = 1,…, 19 | Bits | 45096 | 36896 |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A |  |  |  |
| For Slots i = 1,…, 19 | Bits | 24 | 24 |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A |  |  |  |
| For Slots i = 1,…, 19 | CBs | 6 | 5 |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A |  |  |  |
| For Slots i = 10, 11 | Bits | 52416 | 52416 |  |  |  |
| For Slots i = 1,…, 9, 12, …, 19 | Bits | 54912 | 54912 |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 42.841 | 35.051 |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.1.1-5: PDSCH Reference Channel for FDD and CSI-RS overlapped with PDSCH

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-5.1 FDD |  |  |  |  |
| Channel bandwidth | MHz | 10 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Number of allocated resource blocks | PRBs | 52 |  |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 |  |  |  |  |
| Allocated slots per 2 frames | Slots | 19 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 1,…, 19 | Bits | 26120 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 1,…, 19 | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A |  |  |  |  |
| For Slots i = 1,…, 19 | CBs | 4 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 5, 15 | Bits | 50752 |  |  |  |  |
| For Slots i = 10 | Bits | 48256 |  |  |  |  |
| For Slots i = 11 | Bits | 52416 |  |  |  |  |
| For Slots i = 1,…,4,6,…, 9,12,…14,16,…,19 | Bits | 54912 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 24.814 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.1.1-6: PDSCH Reference Channel for FDD PMI reporting requirements

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-6.1 FDD | R.PDSCH.1-6.2 FDD | R.PDSCH.1-6.3 FDD |  |  |
| Channel bandwidth | MHz | 10 | 10 | 10 |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 |  |  |
| Number of allocated resource blocks | PRBs | 52 | 52 | 52 |  |  |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 |  |  |
| Allocated slots per 2 frames | Slots | 15 | 15 | 15 |  |  |
| MCS table |  | 64QAM | 64QAM | 64QAM |  |  |
| MCS index |  | 13 | 13 | 20 |  |  |
| Modulation |  | 16QAM | 16QAM | 64QAM |  |  |
| Target Coding Rate |  | 0.48 | 0.48 | 0.55 |  |  |
| Number of MIMO layer |  | 1 | 2 | 2 |  |  |
| Number of DMRS REs (Note 3) |  | 24 | 24 | 24 |  |  |
| Overhead for TBS determination |  | 0 | 0 | 0 |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A |  |  |
| For CSI Slots i, if mod (i,5) =1, i={0,…,19} |  | N/A | N/A | N/A |  |  |
| For Non CSI-RS Slot i, if mod (i,5) ={0,2,3,4}, i={1,..19} | Bits | 12040 | 24072 | 40976 |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A |  |  |
| For CSI Slots i, if mod (i,5) =1, i={0,…,19} |  | N/A | N/A | N/A |  |  |
| For Non CSI-RS Slot i, if mod (i,5) ={0,2,3,4}, i={1,..19} | Bits | 24 | 24 | 24 |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A |  |  |
| For CSI Slots i, if mod (i,5) =1, i={0,…,19} |  | N/A | N/A | N/A |  |  |
| For Non CSI-RS Slot i, if mod (i,5) ={0,2,3,4}, i={1,..,19} | CBs | 2 | 3 | 5 |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A |  |  |
| For CSI Slots i, if mod (i,5) =1, i={0,…,19} |  | N/A | N/A | N/A |  |  |
| For Slots i = 10 | Bits | 23712 | 47424 | 71136 |  |  |
| For Non CSI-RS Slot i, if mod (i,5) ={0,2,3,4}, i={1,..9,11,…,19} | Bits | 24960 | 49920 | 74880 |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 9.030 | 18.054 | 30.732 |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data. | | | | | | |

Table A.3.2.1.1-7: PDSCH Reference Channel for FDD LTE-NR coexistence scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-7.1 FDD | R.PDSCH.1-7.2 FDD | R.PDSCH.1-7.3 FDD |  |  |
| Channel bandwidth | MHz | 10 | 10 | 10 |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 |  |  |
| Number of allocated resource blocks | PRBs | 52 | 52 | 52 |  |  |
| Number of consecutive PDSCH symbols |  | 9 | 11 | 9 |  |  |
| Allocated slots per 2 frames | Slots | 16 | 16 | 16 |  |  |
| MCS table |  | 64QAM | 64QAM | 64QAM |  |  |
| MCS index |  | 4 | 4 | 13 |  |  |
| Modulation |  | QPSK | QPSK | 16QAM |  |  |
| Target Coding Rate |  | 0.30 | 0.30 | 0.48 |  |  |
| Number of MIMO layers |  | 1 | 1 | 1 |  |  |
| Number of DMRS REs |  | 12 | 12 | 12 |  |  |
| Overhead for TBS determination |  | 18 | 18 | 12 |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15 | Bits | N/A | N/A | N/A |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | Bits | 2472 | 3240 | 8456 |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15 | Bits | N/A | N/A | N/A |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | Bits | 16 | 16 | 24 |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15 | CBs | N/A | N/A | N/A |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | CBs | 1 | 1 | 2 |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15 | Bits | N/A | N/A | N/A |  |  |
| For Slots i = 11 | Bits | 7760 | 10256 | 16224 |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} for i from {1,…, 9, 12, …, 19} | Bits | 8384 | 10880 | 17472 |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 1.978 | 2.592 | 6.764 |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: No user data is scheduled on slots with LTE PBCH/PSS/SSS | | | | | | |

Table A.3.2.1.1-8: PDSCH Reference Channel for FDD HST scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-8.1 FDD | R.PDSCH.1-8.2 FDD | R.PDSCH.1-8.3 FDD | R.PDSCH.1-8.4 FDD | R.PDSCH.1-8.5 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 |
| Number of allocated resource blocks | PRBs | 52 | 52 | 52 | 52 | 52 |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 | 19 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 17 | 13 | 17 | 13 |
| Modulation |  | 16QAM | 64QAM | 16QAM | 64QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.43 | 0.48 | 0.43 | 0.48 |
| Number of MIMO layers |  | 1 | 1 | 2 | 2 | 2 |
| Number of DMRS REs |  | 18 | 18 | 18 | 18 | 18 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 12552 | 16896 | 25104 | 28680 | 25104 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | CBs | 2 | 3 | 3 | 4 | 5 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,2,11,12 | Bits | 24960 | 37440 | 51168 | 76752 | 47424 |
| For Slots i = 3,…, 10, 13, …, 19 | Bits | 26208 | 39312 | 52416 | 78624 | 52416 |
| Max. Throughput averaged over 2 frames | Mbps | 11.924 | 16.0512 | 23.8488 | 27.246 | 23.8488 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.1.1-9: PDSCH Reference Channel for FDD CC and CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-9.1 FDD | R.PDSCH.1-9.2 FDD | R.PDSCH.1-9.3 FDD | R.PDSCH.1-9.4 FDD | R.PDSCH.1-9.5 FDD |
| Channel bandwidth | MHz | 5 | 15 | 20 | 25 | 30 |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 |
| Number of allocated resource blocks | PRBs | 25 | 79 | 106 | 133 | 160 |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 | 19 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 | 13 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  | 12 | 12 | 12 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 12552 | 39936 | 53288 | 67584 | 79896 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | CBs | 2 | 5 | 7 | 9 | 10 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 10, 11 | Bits | 25200 | 79632 | 106848 | 134064 | 161280 |
| For Slots i =1,…, 9, 12, …, 19 | Bits | 26400 | 83424 | 111936 | 140448 | 168960 |
| Max. Throughput averaged over 2 frames | Mbps | 11.924 | 37.939 | 50.624 | 64.205 | 75.901 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.1.1-10: PDSCH Reference Channel for FDD CC and CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.1-10.1 FDD | R.PDSCH.1-10.2 FDD | R.PDSCH.1-10.3 FDD | R.PDSCH.1-10.4 FDD |  |
| Channel bandwidth | MHz | 40 | 50 | 35 | 45 |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 |  |
| Number of allocated resource blocks | PRBs | 216 | 270 | 188 | 242 |  |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 | 12 |  |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 |  |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM |  |
| MCS index |  | 13 | 13 | 13 | 13 |  |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM |  |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 |  |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 |  |
| Number of DMRS REs |  | 12 | 12 | 12 | 12 |  |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | Bits | 108552 | 135296 | 94248 | 122976 |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | Bits | 24 | 24 | 24 | 24 |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | CBs | 13 | 17 | 12 | 15 |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 10, 11 | Bits | 217728 | 272160 | 189504 | 243936 |  |
| For Slots i =1,…, 9, 12, …, 19 | Bits | 228096 | 285120 | 198528 | 255552 |  |
| Max. Throughput averaged over 2 frames | Mbps | 103.124 | 128.531 | 89.536 | 116.827 |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.1.1-11: PDSCH Reference Channel for FDD

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.1-11.1 FDD | R.PDSCH.1-11.2 FDD |  |  |  |
| Channel bandwidth | MHz | 10 | 10 |  |  |  |
| Subcarrier spacing | kHz | 15 | 15 |  |  |  |
| Number of allocated resource blocks | PRBs | 52 | 52 |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 | 12 |  |  |  |
| Allocated slots per 2 frames | Slots | 18 | 18 |  |  |  |
| MCS table |  | 64QAMLowSE | 64QAMLowSE |  |  |  |
| MCS index |  | 19 | 19 |  |  |  |
| Modulation |  | 16QAM | 16QAM |  |  |  |
| Target Coding Rate |  | 0.54 | 0.54 |  |  |  |
| Number of MIMO layers |  | 1 | 1 |  |  |  |
| Number of DMRS REs |  | 12 | 12 |  |  |  |
| Overhead for TBS determination |  | 0 | 0 |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0,1 | Bits | N/A | N/A |  |  |  |
| For Slots i = 2,…, 19 | Bits | 14856 | 14856 |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0,1 | Bits | N/A | N/A |  |  |  |
| For Slots i = 2,…, 19 | Bits | 24 | 24 |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0,1 | CBs | N/A | N/A |  |  |  |
| For Slots i = 2,…, 19 | CBs | 2 | 2 |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0,1 | Bits | N/A | N/A |  |  |  |
| For Slots i = 10, 11 | Bits | 26208 | 24960 |  |  |  |
| For Slots i =2,…, 9, 12, …, 19 | Bits | 27456 | 27456 |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 6.685 (NOTE 3) | 6.685 (NOTE 4) |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: Throughput is calculated under assumption of aggregation factor 2.  Note 4: Throughput is calculated under assumption of repetition number 2. | | | | | | |

Table A.3.2.1.1-12: PDSCH Reference Channel for FDD

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.1-12.1 FDD |  |  |  |  |
| Channel bandwidth | MHz | 10 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Number of allocated resource blocks | PRBs | 52 |  |  |  |  |
| Number of consecutive PDSCH symbols |  | 2 |  |  |  |  |
| Allocated slots per 2 frames | Slots | 19 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 4 |  |  |  |  |
| Modulation |  | QPSK |  |  |  |  |
| Target Coding Rate |  | 0.3 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  | 6 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 1,…, 19 | Bits | 576 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 1,…, 19 | Bits | 16 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A |  |  |  |  |
| For Slots i = 1,…, 19 | CBs | 1 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 10, 11 | Bits | 1872 |  |  |  |  |
| For Slots i =1,…, 9, 12, …, 19 | Bits | 1872 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 0.547 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.1.1-13: PDSCH Reference Channel for FDD HST-SFN with CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Values** | | | | |
| Reference channel |  | R.PDSCH.1-13.1 FDD | R.PDSCH.1-13.2 FDD | R.PDSCH.1-13.3 FDD | R.PDSCH.1-13.4 FDD | R.PDSCH.1-13.5 FDD |
| Channel bandwidth | MHz | 5 | 15 | 20 | 25 | 30 |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 |
| Number of allocated resource blocks | PRBs | 25 | 79 | 106 | 133 | 160 |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 | 19 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 | 13 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  | 18 | 18 | 18 | 18 | 18 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 12040 | 37896 | 51216 | 64552 | 77896 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | CBs | 2 | 5 | 7 | 8 | 10 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,2,11,12 (Note 3) | Bits | 24000 | 77136 | 104352 | 131568 | 158784 |
| For Slots i = 3,…, 10, 13, …, 19 | Bits | 25200 | 79632 | 106848 | 134064 | 161280 |
| Max. Throughput averaged over 2 frames | Mbps | 11.438 | 36.001 | 48.655 | 61.324 | 74.001 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52. | | | | | | |

Table A.3.2.1.1-14: PDSCH Reference Channel for FDD HST-SFN with CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Values** | | | | |
| Reference channel |  | R.PDSCH.1-14.1 FDD | R.PDSCH.1-14.2 FDD | R.PDSCH.1-14.3 FDD | R.PDSCH.1-14.4 FDD |  |
| Channel bandwidth | MHz | 40 | 50 | 35 | 45 |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 |  |
| Number of allocated resource blocks | PRBs | 216 | 270 | 188 | 242 |  |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 | 12 |  |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 |  |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM |  |
| MCS index |  | 13 | 13 | 13 | 13 |  |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM |  |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 |  |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 |  |
| Number of DMRS REs |  | 18 | 18 | 18 | 18 |  |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | Bits | 104496 | 131176 | 90176 | 116792 |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | Bits | 24 | 24 | 24 | 24 |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | CBs | 13 | 16 | 11 | 14 |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,2,11,12 (Note 3) | Bits | 215232 | 269664 | 187008 | 241440 |  |
| For Slots i = 3,…, 10, 13, …, 19 | Bits | 217728 | 272160 | 189504 | 243936 |  |
| Max. Throughput averaged over 2 frames | Mbps | 99.271 | 124.617 | 85.667 | 110.952 |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52. | | | | | | |

Table A.3.2.1.1-15: PDSCH Reference Channel for FDD HST-DPS with CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Values** | | | | |
| Reference channel |  | R.PDSCH.1-15.1 FDD | R.PDSCH.1-15.2 FDD | R.PDSCH.1-15.3 FDD | R.PDSCH.1-15.4 FDD | R.PDSCH.1-15.5 FDD |
| Channel bandwidth | MHz | 5 | 15 | 20 | 25 | 30 |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 |
| Number of allocated resource blocks | PRBs | 25 | 79 | 106 | 133 | 160 |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 | 19 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 17 | 17 | 17 | 17 | 17 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  | 18 | 18 | 18 | 18 | 18 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 16136 | 51216 | 67584 | 86040 | 104496 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | CBs | 2 | 7 | 9 | 11 | 13 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,2,11,12 (Note 3) | Bits | 36000 | 115704 | 156528 | 197352 | 238176 |
| For Slots i = 3,…, 10, 13, …, 19 | Bits | 37800 | 119448 | 160272 | 201096 | 241920 |
| Max. Throughput averaged over 2 frames | Mbps | 15.3292 | 48.655 | 64.2048 | 81.738 | 99.2712 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52. | | | | | | |

Table A.3.2.1.1-16: PDSCH Reference Channel for FDD HST-DPS with CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Values** | | | | |
| Reference channel |  | R.PDSCH.1-16.1 FDD | R.PDSCH.1-16.2 FDD | R.PDSCH.1-16.3 FDD | R.PDSCH.1-16.4 FDD |  |
| Channel bandwidth | MHz | 40 | 50 | 35 | 45 |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 |  |
| Number of allocated resource blocks | PRBs | 216 | 270 | 188 | 242 |  |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 | 12 |  |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 |  |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM |  |
| MCS index |  | 17 | 17 | 17 | 17 |  |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM |  |
| Target Coding Rate |  | 0.43 | 0.43 | 0.43 | 0.43 |  |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 |  |
| Number of DMRS REs |  | 18 | 18 | 18 | 18 |  |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | Bits | 139376 | 176208 | 120936 | 155776 |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | Bits | 24 | 24 | 24 | 24 |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | CBs | 17 | 21 | 15 | 19 |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,2,11,12 (Note 3) | Bits | 322848 | 404496 | 280512 | 362160 |  |
| For Slots i = 3,…, 10, 13, …, 19 | Bits | 326592 | 408240 | 284256 | 365904 |  |
| Max. Throughput averaged over 2 frames | Mbps | 132.407 | 167.3976 | 114.8892 | 147.9872 |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52. | | | | | | |

Table A.3.2.1.1-17: PDSCH Reference Channel for FDD (1024QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.1-17.1 FDD |  |  |  |  |
| Channel bandwidth | MHz | 10 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Number of allocated resource blocks | PRBs | 52 |  |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 |  |  |  |  |
| Allocated slots per 2 frames | Slots | 19 |  |  |  |  |
| MCS table |  | 1024QAM |  |  |  |  |
| MCS index |  | 23 |  |  |  |  |
| Modulation |  | 1024QAM |  |  |  |  |
| Target Coding Rate |  | 0.79 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 1,…, 19 | Bits | 54296 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 1,…, 19 | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A |  |  |  |  |
| For Slots i = 1,…, 19 | CBs | 7 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 10, 11 | Bits | 65520 |  |  |  |  |
| For Slots i =1,…, 9, 12, …, 19 | Bits | 68640 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 51.581 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.1.1-18: PDSCH Reference Channel for FDD CRS interference mitigation for NR scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-18.1 FDD |  |  |  |  |
| Channel bandwidth | MHz | 10 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Number of allocated resource blocks | PRBs | 52 |  |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 |  |  |  |  |
| Allocated slots per 2 frames | Slots | 16 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15 | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | Bits | 13064 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15 | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15 | CBs | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15 | Bits | N/A |  |  |  |  |
| For Slots i = 11 | Bits | 22880 |  |  |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} for i from {1,…, 9, 12, …, 19} | Bits | 24128 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 10.4512 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: No user data is scheduled on slots with PBCH/PSS/SSS on the interference LTE cell | | | | | | |

Table A.3.2.1.1-19: PDSCH Reference Channel for FDD CRS interference mitigation for NR scenario for inter-RAT measurement enabled

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-17.2 FDD |  |  |  |  |
| Channel bandwidth | MHz | 10 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Number of allocated resource blocks | PRBs | 52 |  |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 |  |  |  |  |
| Allocated slots per 4 frames | Slots | 26 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  | 12 |  |  |  |  |
| For Slots i = 0,5,10,15,20,25,30,35 |  | N/A |  |  |  |  |
| For Slots in meauresment gao i= 7,8,9,10,11,12 |  | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} and i≠7,8,9,11,12 |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15,20,25,30,35 | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= 7,8,9,10,11,12 | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} and i≠7,8,9,11,12 | Bits | 13064 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15,20,25,30,35 | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= 7,8,9,10,11,12 | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} and i≠7,8,9,11,12 | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15,20,25,30,35 | CBs | N/A |  |  |  |  |
| For Slots in meauresment gao i= 7,8,9,10,11,12 | CBs | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} and i≠7,8,9,11,12 | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15,20,25,30,35 | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= 7,8,9,10,11,12 |  | N/A |  |  |  |  |
| For Slots i = {11, 31} |  | 22880 |  |  |  |  |
| For Slots i, if mod(i, 5) = {1,2,3,4} and i≠7,8,9,11,12,31 | Bits | 24128 |  |  |  |  |
| Max. Throughput averaged over 4 frames | Mbps | 8.4916 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 4 frames  Note 3: No user data is scheduled on slots with PBCH/PSS/SSS on the interference LTE cell  Note 4: No user data is scheduled on slots used for measurement | | | | | | |

#### A.3.2.1.2 Reference measurement channels for SCS 30 kHz FR1

Table A.3.2.1.2-1: PDSCH Reference Channel for FDD (64QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-1.1 FDD |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Number of allocated resource blocks | PRBs | 51 |  |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 |  |  |  |  |
| Allocated slots per 2 frames | Slots | 39 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 19 |  |  |  |  |
| Modulation |  | 64QAM |  |  |  |  |
| Target Coding Rate |  | 0.51 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 1,…, 39 | Bits | 40976 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 1,…, 39 | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A |  |  |  |  |
| For Slots i = 1,…, 39 | CBs | 5 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 20, 21 | Bits | 77112 |  |  |  |  |
| For Slots i = 1,…, 19, 22, …, 39 | Bits | 80784 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 79.903 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

#### A.3.2.1.3 Reference measurement channels for SCS 60 kHz FR1

#### A.3.2.1.4 Reference measurement channels for E-UTRA

Table A.3.2.1.4-1: PDSCH Reference Channel for sustained data-rate test (64QAM, 2 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.4-1.1 FDD | R.PDSCH.4-1.2 FDD | R.PDSCH.4-1.3 FDD | R.PDSCH.4-1.4 FDD |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | Note 6 | Note 7 | Note 8 | Note 9 |
| Allocated subframes per Radio Frame |  | 9 | 10 | 10 | 10 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9, |  | 0.85 | 0.85 | 0.85 | 0.88 |
| For Sub-Frame 5 |  | N/A | 0.89 | 0.91 | 0.87 |
| For Sub-Frame 0 |  | 0.83 | 0.90 | 0.88 | 0.90 |
| Information Bit Payload (Note 3) |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 18336 | 36696 | 55056 | 75376 |
| For Sub-Frame 5 | Bits | N/A | 35160 | 52752 | 71112 |
| For Sub-Frame 0 | Bits | 15840 | 36696 | 55056 | 75376 |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | CBs | 3 | 6 | 9 | 13 |
| For Sub-Frame 5 | CBs | N/A | 6 | 9 | 12 |
| For Sub-Frame 0 | CBs | 3 | 6 | 9 | 13 |
| Binary Channel Bits (Note 3) |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 21600 | 43200 | 64800 | 86400 |
| For Sub-Frame 5 | Bits | N/A | 39744 | 60480 | 82080 |
| For Sub-Frame 0 | Bits | 19152 | 40752 | 62352 | 83952 |
| Number of layers |  | 2 | 2 | 2 | 2 |
| Max. Throughput averaged over 1 frame (Note 3) | Mbps | 16.253 | 36.542 | 54.826 | 74.950 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: Given per component carrier per codeword.  Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 5: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 6: Resource blocks nPRB = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9. | | | | | |

Table A.3.2.1.4-2: PDSCH Reference Channel for sustained data-rate test (64QAM, 4 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.4-2.1 FDD | R.PDSCH.4-2.2 FDD | R.PDSCH.4-2.3 FDD | R.PDSCH.4-2.4 FDD |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | Note 6 | Note 7 | Note 8 | Note 9 |
| Allocated subframes per Radio Frame |  | 9 | 10 | 10 | 10 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9, |  | 0.78 | 0.78 | 0.77 | 0.79 |
| For Sub-Frame 5 |  | N/A | 0.80 | 0.79 | 0.81 |
| For Sub-Frame 0 |  | 0.85 | 0.83 | 0.8 | 0.81 |
| Information Bit Payload (Note 3) |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 31704 | 63776 | 93800 | 128496 |
| For Sub-Frame 5 | Bits | N/A | 59256 | 90816 | 124464 |
| For Sub-Frame 0 | Bits | 30576 | 63776 | 93800 | 128496 |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | CBs | 6 | 11 | 16 | 21 |
| For Sub-Frame 5 | CBs | N/A | 10 | 15 | 21 |
| For Sub-Frame 0 | CBs | 5 | 11 | 16 | 21 |
| Binary Channel Bits (Note 3) |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 40800 | 81600 | 122400 | 163200 |
| For Sub-Frame 5 | Bits | N/A | 74976 | 114144 | 154944 |
| For Sub-Frame 0 | Bits | 36192 | 76992 | 117792 | 158592 |
| Number of layers |  | 4 | 4 | 4 | 4 |
| Max. Throughput averaged over 1 frame (Note 3) | Mbps | 28.421 | 63.324 | 93.502 | 128.093 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: Given per component carrier per codeword.  Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 5: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 6: Resource blocks nPRB = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9. | | | | | |

Table A.3.2.1.4-3: PDSCH Reference Channel for sustained data-rate test (256QAM, 2 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.4-3.1 FDD | R.PDSCH.4-3.2 FDD | R.PDSCH.4-3.3 FDD | R.PDSCH.4-3.4 FDD |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | Note 6 | Note 7 | Note 8 | Note 9 |
| Allocated subframes per Radio Frame |  | 10 | 10 | 10 | 10 |
| Modulation |  | 256QAM | 256QAM | 256QAM | 256QAM |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 |  | 0.85 | 0.85 | 0.88 | 0.85 |
| For Sub-Frames 1,2,6,7 |  | 0.77 | 0.74 | 0.74 | 0.74 |
| For Sub-Frame 5 |  | 0.79 | 0.77 | 0.77 | 0.75 |
| For Sub-Frame 0 |  | 0.84 | 0.78 | 0.77 | 0.76 |
| Information Bit Payload (Note 3) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 24496 | 48936 | 75376 | 97896 |
| For Sub-Frames 1,2,6,7 | Bits | 21384 | 42368 | 63776 | 84760 |
| For Sub-Frame 5 | Bits | 19848 | 40576 | 61664 | 81176 |
| For Sub-Frame 0 | Bits | 21384 | 42368 | 63776 | 84760 |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | CBs | 4 | 8 | 13 | 16 |
| For Sub-Frames 1,2,6,7 | CBs | 4 | 7 | 11 | 14 |
| For Sub-Frame 5 | CBs | 4 | 7 | 11 | 14 |
| For Sub-Frame 0 | CBs | 4 | 7 | 11 | 14 |
| Binary Channel Bits (Note 3) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 28800 | 57600 | 86400 | 115200 |
| For Sub-Frames 1,2,6,7 | Bits | 28800 | 57600 | 86400 | 115200 |
| For Sub-Frame 5 | Bits | 25344 | 52992 | 80640 | 109440 |
| For Sub-Frame 0 | Bits | 25536 | 54336 | 83136 | 111936 |
| Number of layers |  | 2 | 2 | 2 | 2 |
| Max. Throughput averaged over 1 frame (Note 3) | Mbps | 22.475 | 44.816 | 68.205 | 89.656 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: Given per component carrier per codeword.  Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 5: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 6: Resource blocks nPRB = 2..24 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9. | | | | | |

Table A.3.2.1.4-4: PDSCH Reference Channel for sustained data-rate test (256QAM, 4 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.4-4.1 FDD | R.PDSCH.4-4.2 FDD | R.PDSCH.4-4.3 FDD | R.PDSCH.4-4.4 FDD |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | Note 6 | Note 7 | Note 8 | Note 9 |
| Allocated subframes per Radio Frame |  | 10 | 10 | 10 | 10 |
| Modulation |  | 256QAM | 256QAM | 256QAM | 256QAM |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 |  | 0.85 | 0.78 | 0.79 | 0.78 |
| For Sub-Frames 1,2,6,7 |  | 0.77 | 0.78 | 0.79 | 0.78 |
| For Sub-Frame 5 |  | 0.79 | 0.82 | 0.82 | 0.786 |
| For Sub-Frame 0 |  | 0.84 | 0.83 | 0.82 | 0.80 |
| Information Bit Payload (Note 3) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 42368 | 84760 | 128496 | 169544 |
| For Sub-Frames 1,2,6,7 | Bits | 42368 | 84760 | 128496 | 169544 |
| For Sub-Frame 5 | Bits | 39232 | 81176 | 124464 | 161760 |
| For Sub-Frame 0 | Bits | 39232 | 84760 | 128496 | 169544 |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | CBs | 7 | 14 | 21 | 28 |
| For Sub-Frames 1,2,6,7 | CBs | 7 | 14 | 21 | 28 |
| For Sub-Frame 5 | CBs | 7 | 14 | 21 | 27 |
| For Sub-Frame 0 | CBs | 7 | 14 | 21 | 28 |
| Binary Channel Bits (Note 3) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 54400 | 108800 | 163200 | 217600 |
| For Sub-Frames 1,2,6,7 | Bits | 54400 | 108800 | 163200 | 217600 |
| For Sub-Frame 5 | Bits | 47744 | 99968 | 152192 | 206592 |
| For Sub-Frame 0 | Bits | 48256 | 102656 | 157056 | 211456 |
| Number of layers |  | 4 | 4 | 4 | 4 |
| Max. Throughput averaged over 1 frame (Note 3) | Mbps | 41.741 | 84.4016 | 128.093 | 168.766 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: Given per component carrier per codeword.  Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 5: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 6: Resource blocks nPRB = 2..24 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9. | | | | | |

Table A.3.2.1.4-5: PDSCH Reference Channel for sustained data-rate test (1024QAM, 2 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.4-5.1 FDD | R.PDSCH.4-5.2 FDD | R.PDSCH.4-5.3 FDD | R.PDSCH.4-5.4 FDD |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | Note 6 | Note 7 | Note 8 | Note 9 |
| Allocated subframes per Radio Frame |  | 10 | 10 | 10 | 10 |
| Modulation |  | 1024QAM | 1024QAM | 1024QAM | 1024QAM |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 |  | 0.76 | 0.73 | 0.75 | 0.76 |
| For Sub-Frames 1,2,6,7 |  | 0.76 | 0.73 | 0.75 | 0.76 |
| For Sub-Frame 5 |  | 0.80 | 0.77 | 0.78 | 0.77 |
| For Sub-Frame 0 |  | 0.86 | 0.78 | 0.78 | 0.79 |
| Information Bit Payload (Note 3) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 27376 | 52752 | 81176 | 110136 |
| For Sub-Frames 1,2,6,7 | Bits | 27376 | 52752 | 81176 | 110136 |
| For Sub-Frame 5 | Bits | 25456 | 51024 | 78704 | 105528 |
| For Sub-Frame 0 | Bits | 27376 | 52752 | 81176 | 110136 |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | CBs | 5 | 9 | 14 | 18 |
| For Sub-Frames 1,2,6,7 | CBs | 5 | 9 | 14 | 18 |
| For Sub-Frame 5 | CBs | 5 | 9 | 13 | 18 |
| For Sub-Frame 0 | CBs | 5 | 9 | 14 | 18 |
| Binary Channel Bits (Note 3) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 36000 | 72000 | 108000 | 144000 |
| For Sub-Frames 1,2,6,7 | Bits | 36000 | 72000 | 108000 | 144000 |
| For Sub-Frame 5 | Bits | 31680 | 66240 | 100800 | 136800 |
| For Sub-Frame 0 | Bits | 31920 | 67920 | 103920 | 139920 |
| Number of layers |  | 2 | 2 | 2 | 2 |
| Max. Throughput averaged over 1 frame (Note 3) | Mbps | 27.18 | 52.58 | 80.93 | 109.68 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: Given per component carrier per codeword.  Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 5: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 6: Resource blocks nPRB = 2..24 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9. | | | | | |

Table A.3.2.1.4-6: PDSCH Reference Channel for sustained data-rate test (1024QAM, 4 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.4-6.1 FDD | R.PDSCH.4-6.2 FDD | R.PDSCH.4-6.3 FDD | R.PDSCH.4-6.4 FDD |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | Note 6 | Note 7 | Note 8 | Note 9 |
| Allocated subframes per Radio Frame |  | 10 | 10 | 10 | 10 |
| Modulation |  | 1024QAM | 1024QAM | 1024QAM | 1024QAM |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 |  | 0.78 | 0.81 | 0.79 | 0.81 |
| For Sub-Frames 1,2,6,7 |  | 0.78 | 0.81 | 0.79 | 0.81 |
| For Sub-Frame 5 |  | 0.82 | 0.81 | 0.83 | 0.82 |
| For Sub-Frame 0 |  | 0.87 | 0.86 | 0.82 | 0.83 |
| Information Bit Payload (Note 3) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 52752 | 110136 | 161760 | 220296 |
| For Sub-Frames 1,2,6,7 | Bits | 52752 | 110136 | 161760 | 220296 |
| For Sub-Frame 5 | Bits | 48936 | 101840 | 157432 | 211936 |
| For Sub-Frame 0 | Bits | 52752 | 110136 | 161760 | 220296 |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | CBs | 9 | 18 | 27 | 36 |
| For Sub-Frames 1,2,6,7 | CBs | 9 | 18 | 27 | 36 |
| For Sub-Frame 5 | CBs | 8 | 17 | 26 | 35 |
| For Sub-Frame 0 | CBs | 9 | 18 | 27 | 36 |
| Binary Channel Bits (Note 3) |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 68000 | 136000 | 204000 | 272000 |
| For Sub-Frames 1,2,6,7 | Bits | 68000 | 136000 | 204000 | 272000 |
| For Sub-Frame 5 | Bits | 59680 | 124960 | 190240 | 258240 |
| For Sub-Frame 0 | Bits | 60320 | 128320 | 196320 | 264320 |
| Number of layers |  | 4 | 4 | 4 | 4 |
| Max. Throughput averaged over 1 frame (Note 3) | Mbps | 52.37 | 109.31 | 161.33 | 219.46 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: Given per component carrier per codeword.  Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 5: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 6: Resource blocks nPRB = 2..24 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9. | | | | | |

#### A.3.2.1.5 Reference measurement channels for Intra-cell Inter-UE interference scenario

Table A.3.2.1.5-1: PDSCH Reference Channel for FDD Intra-cell Inter-UE interference scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.5-1.1 FDD | R.PDSCH.5-1.2 FDD |  |  |  |
| Channel bandwidth | MHz | 10 | 10 |  |  |  |
| Subcarrier spacing | kHz | 15 | 15 |  |  |  |
| Number of allocated resource blocks | PRBs | 52 | 52 |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 | 12 |  |  |  |
| Allocated slots per 2 frames | Slots | 19 | 19 |  |  |  |
| MCS table |  | 64QAM | 64QAM |  |  |  |
| MCS index |  | 13 | 13 |  |  |  |
| Modulation |  | 16QAM | 16QAM |  |  |  |
| Target Coding Rate |  | 0.48 | 0.48 |  |  |  |
| Number of MIMO layers |  | 1 | 2 |  |  |  |
| Number of DMRS REs |  | 12 | 24 |  |  |  |
| Overhead for TBS determination |  | 0 | 0 |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A |  |  |  |
| For Slots i = 1,…, 19 | Bits | 13064 | 24072 |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A |  |  |  |
| For Slots i = 1,…, 19 | Bits | 24 | 24 |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A |  |  |  |
| For Slots i = 1,…, 19 | CBs | 2 | 3 |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A |  |  |  |
| For Slots i = 10, 11 | Bits | 26208 | 47424 |  |  |  |
| For Slots i = 1,…, 9, 12, …, 19 | Bits | 27456 | 49920 |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 12.411 | 22.868 |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

### A.3.2.2 TDD

#### A.3.2.2.1 Reference measurement channels for SCS 15 kHz FR1

Table A.3.2.2.1-1: PDSCH Reference Channel for TDD UL-DL pattern FR1.15-1 and LTE-NR coexistence scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-1.1 TDD | R.PDSCH.1-1.2 TDD | R.PDSCH.1-1.3 TDD |  |  |
| Channel bandwidth | MHz | 10 | 10 | 20 |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 |  |  |
| Allocated resource blocks | PRBs | 52 | 52 | 106 |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} |  | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} |  | 9 | 11 | 9 |  |  |
| Allocated slots per 2 frames |  | 7 | 7 | 7 |  |  |
| MCS table |  | 64QAM | 64QAM | 64QAM |  |  |
| MCS index |  | 4 | 4 | 13 |  |  |
| Modulation |  | QPSK | QPSK | 16QAM |  |  |
| Target Coding Rate |  | 0.30 | 0.30 | 0.48 |  |  |
| Number of MIMO layers |  | 1 | 1 | 1 |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} |  | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} |  | 12 | 12 | 12 |  |  |
| Overhead for TBS determination |  | 18 | 18 | 18 |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | Bits | 2472 | 3240 | 15880 |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | Bits | 16 | 16 | 24 |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | CBs | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | CBs | 1 | 1 | 2 |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A | N/A | N/A |  |  |
| For Slots i = 10, 11 | Bits | 7760 | 10256 | 32672 |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,9,12,…,19} | Bits | 8384 | 10880 | 33920 |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 0.865 | 1.134 | 5.558 |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: No user data is scheduled on slots with LTE PBCH/PSS/SSS | | | | | | |

Table A.3.2.2.1-2: PDSCH Reference Channel for TDD CC with UL-DL pattern FR1.15-1 and CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-2.1 TDD | R.PDSCH.1-2.2 TDD | R.PDSCH.1-2.3 TDD | R.PDSCH.1-2.4 TDD | R.PDSCH.1-2.5 TDD |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 | 25 |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 |
| Number of allocated resource blocks | PRBs | 25 | 52 | 79 | 106 | 133 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} |  | 8 | 8 | 8 | 8 | 8 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames | Slots | 15 | 15 | 15 | 15 | 15 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 | 13 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} |  | 12 | 12 | 12 | 12 | 12 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} |  | 12 | 12 | 12 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 8064 | 16896 | 25608 | 33816 | 43032 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | Bits | 12552 | 26120 | 39936 | 53288 | 67584 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 24 | 24 | 24 | 24 | 24 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | CBs | 1 | 3 | 4 | 5 | 6 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | CBs | 2 | 4 | 5 | 7 | 9 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 10, 11 | Bits | 25200 | 52416 | 79632 | 106848 | 134064 |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 16800 | 34944 | 53088 | 71232 | 89376 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,9,12,…,19} | Bits | 26400 | 54912 | 83424 | 111936 | 140448 |
| Max. Throughput averaged over 2 frames | Mbps | 8.516 | 17.745 | 27.086 | 36.072 | 45.778 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.2.1-3: PDSCH Reference Channel for TDD CC with UL-DL pattern FR1.15-1 and CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-3.1 TDD | R.PDSCH.1-3.2 TDD | R.PDSCH.1-3.3 TDD |  |  |
| Channel bandwidth | MHz | 30 | 40 | 50 |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 |  |  |
| Number of allocated resource blocks | PRBs | 160 | 216 | 270 |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} |  | 8 | 8 | 8 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} |  | 12 | 12 | 12 |  |  |
| Allocated slots per 2 frames | Slots | 15 | 15 | 15 |  |  |
| MCS table |  | 64QAM | 64QAM | 64QAM |  |  |
| MCS index |  | 13 | 13 | 13 |  |  |
| Modulation |  | 16QAM | 16QAM | 16QAM |  |  |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 |  |  |
| Number of MIMO layers |  | 2 | 2 | 2 |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} |  | 12 | 12 | 12 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} |  | 12 | 12 | 12 |  |  |
| Overhead for TBS determination |  | 0 | 0 | 0 |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 51216 | 69672 | 86040 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | Bits | 79896 | 108552 | 135296 |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 24 | 24 | 24 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | Bits | 24 | 24 | 24 |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | CBs | 7 | 9 | 11 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | CBs | 10 | 13 | 17 |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A |  |  |
| For Slots i = 10, 11 | Bits | 161280 | 217728 | 272160 |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 107520 | 145152 | 181440 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,9,12,…,19} | Bits | 168960 | 228096 | 285120 |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 54.186 | 73.638 | 91.621 |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.2.1-4: PDSCH Reference Channel for TDD CRS interference mitigation for NR scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-4.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 7 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | Bits | 26632 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | CBs | 4 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A |  |  |  |  |
| For Slots i = 10, 11 | Bits | 47936 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1} for i from {1,…,9,12,…,19} | Bits | 49184 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 9.3212 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: No user data is scheduled on slots with PBCH/PSS/SSS on the interference LTE cell | | | | | | |

Table A.3.2.2.1-5: PDSCH Reference Channel for TDD CRS interference mitigation for NR scenario for inter-RAT measurement enabled

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-4.2 TDD |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots i = {2,12,22,32} |  | N/A |  |  |  |  |
| For Slots i= {0,20} |  | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} |  | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4} |  | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,20} |  | 12 |  |  |  |  |
| Allocated slots per 4 frames |  | 16 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots i = {2,12,22,32} |  | N/A |  |  |  |  |
| For Slots i= {0,20} |  | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} |  | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4} |  | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,20} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots i = {2,12,22,32} | Bits | N/A |  |  |  |  |
| For Slots i= {0,20} | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4} | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,20} |  | 26632 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots i = {2,12,22,32} | Bits | N/A |  |  |  |  |
| For Slots i= {0,20} | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4} | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,20} |  | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots i = {2,12,22,32} | CBs | N/A |  |  |  |  |
| For Slots i= {0,20} | CBs | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} | CBs | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4} | CBs | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,20} |  | 4 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots i = {2,12,22,32} | Bits | N/A |  |  |  |  |
| For Slots i= {0,20} | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4} | Bits | N/A |  |  |  |  |
| For Slots i = {10,11,30,31} | Bits | 47936 |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,11,20,31} | Bits | 49184 |  |  |  |  |
| Max. Throughput averaged over 4frames | Mbps | 11.9844 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 4 frames  Note 3: No user data is scheduled on slots with PBCH/PSS/SSS on the interference LTE cell  Note 4: No user data is scheduled on slots used for measurement | | | | | | |

#### A.3.2.2.2 Reference measurement channels for SCS 30 kHz FR1

Table A.3.2.2.2-1: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 and FR1.30-1A (QPSK)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-1.1 TDD | R.PDSCH.2-1.2 TDD | R.PDSCH.2-1.3 TDD | R.PDSCH.2-1.4 TDD | R.PDSCH.2-1.5 TDD |
| Channel bandwidth | MHz | 40 | 40 | 40 | 40 | 20 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 106 | 6 | 106 | 106 | 51 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 | N/A | N/A | 4 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 7 | 12 | 12 |
| Allocated slots per 2 frames |  | 31 | 31 | 27 | 27 | 31 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAMLowSE | 64QAM |
| MCS index |  | 4 | 4 | 4 | 14 | 4 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 0.30 | 0.30 | 0.30 | 0.59 | 0.30 |
| Number of MIMO layers |  | 1 | 1 | 1 | 1 | 1 |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 6 | N/A | N/A | 6 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 18 | 12 | 12 | 12 | 18 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 2664 | 144 | N/A | N/A | 1288 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 8064 | 480 | 4608 | 16392 | 3840 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 16 | 16 | N/A | N/A | 16 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 16 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 1 | 1 | N/A | N/A | 1 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 1 | 1 | 1 | 2 | 1 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 20, 21 | Bits | 25440 | 1512 | 13992 | 26712 | 12240 |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 8904 | 504 | N/A | N/A | 4284 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 26712 | 1584 | 15264 | 27984 | 12852 |
| Max. Throughput averaged over 2 frames | Mbps | 11.419 | 0.677 | 6.221 | 22.129 | 5.442 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.2-2: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 (16QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value | | | | | |
| Reference channel |  | R.PDSCH.2-2.1 TDD | R.PDSCH.2-2.2 TDD | | R.PDSCH.2-2.3 TDD | R.PDSCH.2-2.4 TDD | R.PDSCH.2-2.5 TDD | R.PDSCH.2-2.6 TDD |
| Channel bandwidth | MHz | 40 | 40 | | 40 | 40 | 40 | 40 |
| Subcarrier spacing | kHz | 30 | 30 | | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 106 | 106 | | 106 | 106 | 106 | 106 |
| Number of consecutive PDSCH symbols |  |  |  | |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 | | 4 | 4 | 4 | 4 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames |  | 31 | 31 | | 31 | 31 | 31 | 31 |
| MCS table |  | 64QAM | 64QAM | | 64QAM | 64QAM | 64QAMLowSE | 64QAM |
| MCS index |  | 13 | 13 | | 13 | 13 | 19 | 16 |
| Modulation |  | 16QAM | 16QAM | | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | | 0.48 | 0.48 | 0.54 | 0.64 |
| Number of MIMO layers |  | 1 | 2 | | 3 | 4 | 2 | 1 |
| Number of DMRS REs |  |  |  | |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 6 | | 12 | 12 | 6 | 6 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | | 24 | 24 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  | |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 8456 | 16896 | | 22032 | 29192 | 19464 | 11528 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 26632 | 53288 | | 73776 | 98376 | 60456 | 35856 |
| Transport block CRC per Slot |  |  |  | |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 | 24 | | 24 | 24 | 24 | 24 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6}for i from {1,…,39} | Bits | 24 | 24 | | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  | |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 2 | 3 | | 3 | 4 | 3 | 2 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 4 | 7 | | 9 | 12 | 8 | 5 |
| Binary Channel Bits Per Slot |  |  |  | |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | | N/A | N/A | N/A | N/A |
| For Slots i = 20, 21 | Bits | 53424 | 106848 | | 144008 | 193344 | 101760 | 53424 |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 17808 | 35616 | | 45792 | 61056 | 35616 | 17808 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 55968 | 111936 | | 152640 | 203520 | 111936 | 55968 |
| Max. Throughput averaged over 2 frames | Mbps | 37.644 | 75.318 | | 104.004 | 138.646 | 85.508 | 50.711 |
| NOTE 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  NOTE 2: Slot i is slot index per 2 frames. | | | | | | | | |

Table A.3.2.2.2-3: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 (64QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-3.1 TDD | R.PDSCH.2-3.2 TDD | R.PDSCH.2-3.3 TDD | R.PDSCH.2-3.4 TDD |  |
| Channel bandwidth | MHz | 40 | 40 | 40 | 40 |  |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 |  |
| Allocated resource blocks | PRBs | 106 | 106 | 53 (Note 3) | 53 (Note 4) |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 | 4 | 4 |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 |  |
| Allocated slots per 2 frames |  | 31 | 31 | 31 | 31 |  |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM |  |
| MCS index |  | 19 | 19 | R.PDSCH.2-3.3 TDD | R.PDSCH.2-3.4 TDD |  |
| Modulation |  | 64QAM | 64QAM | 40 | 40 |  |
| Target Coding Rate |  | 0.51 | 0.51 | 30 | 30 |  |
| Number of MIMO layers |  | 2 | 2 | 53 (Note 3) | 53 (Note 4) |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 12 | 4 | 4 |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 24 | 12 | 12 |  |
| Overhead for TBS determination |  | 0 | 0 | 31 | 31 |  |
| Information Bit Payload per Slot |  |  |  | 64QAM | 64QAM |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 27144 | 23040 | 11528 | 11528 |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 83976 | 77896 | 38936 | 38936 |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 | 24 | 24 | 24 |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 | 24 | 24 |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 4 | 3 | 2 | 2 |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 10 | 10 | 5 | 5 |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 20, 21 | Bits | 160272 | 137376 | 68688 | 68688 |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 53424 | 45792 | 22896 | 22896 |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 167904 | 152640 | 76320 | 76320 |  |
| Max. Throughput averaged over 2 frames | Mbps | 118.796 | 109.768 | 54.869 | 54.869 |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: PDSCH is scheduled in PRB numbers from 0 to 52.  Note 4: PDSCH is scheduled in PRB numbers from 53 to 105. | | | | | | |

Table A.3.2.2.2-4: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 (256QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-4.1 TDD | R.PDSCH.2-4.2 TDD |  |  |  |
| Channel bandwidth | MHz | 40 | 20 |  |  |  |
| Subcarrier spacing | kHz | 30 | 30 |  |  |  |
| Allocated resource blocks | PRBs | 106 | 51 |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 |  |  |  |
| Allocated slots per 2 frames |  | 31 | 31 |  |  |  |
| MCS table |  | 256QAM | 256QAM |  |  |  |
| MCS index |  | 24 | 24 |  |  |  |
| Modulation |  | 256QAM | 256QAM |  |  |  |
| Target Coding Rate |  | 0.82 | 0.82 |  |  |  |
| Number of MIMO layers |  | 1 | 1 |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 6 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 |  |  |  |
| Overhead for TBS determination |  | 0 | 0 |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 29192 | 14088 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 92200 | 44040 |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 | 24 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 4 | 2 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 11 | 6 |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slots i = 20, 21 | Bits | 106848 | 51408 |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 35616 | 17136 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 111936 | 53856 |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 130.308 | 62.272 |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.2-5: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-5.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 40 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} |  | 8 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 31 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 4 |  |  |  |  |
| Modulation |  | QPSK |  |  |  |  |
| Target Coding Rate |  | 0.30 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} |  | 12 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | Bits | 5376 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | Bits | 8456 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | CBs | 1 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i = 20, 21 | Bits | 26712 |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | Bits | 17808 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19,22,…,39} | Bits | 27984 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 11.875 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.2-6: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-3

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-6.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 40 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 10) = {4,8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {3,7} for i from {0,…,39} |  | 8 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 27 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 4 |  |  |  |  |
| Modulation |  | QPSK |  |  |  |  |
| Target Coding Rate |  | 0.30 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 10) = {4,8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {3,7} for i from {0,…,39} |  | 12 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 10) = {4,8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {3,7} for i from {0,…,39} | Bits | 5376 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,5,6} for i from {1,…,39} | Bits | 8456 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 10) = {4,8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {3,7} for i from {0,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,5,6} for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 10) = {4,8,9} for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {3,7} for i from {0,…,39} | CBs | 1 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,5,6} for i from {1,…,39} | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 10) = {4,8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i = 20, 21 | Bits | 26712 |  |  |  |  |
| For Slot i, if mod(i, 10) = {3,7} for i from {0,…,39} | Bits | 17808 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,5,6} for i from {1,…,19,22,…,39} | Bits | 27984 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 10.184 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.2-7: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 and CSI-RS overlapped with PDSCH

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-7.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 40 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 31 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 16896 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 53288 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 3 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 7 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,5} for i from {1,…,19,22,…,39} | Bits | 103456 |  |  |  |  |
| For Slots i = 20 | Bits | 98368 |  |  |  |  |
| For Slots i = 21 | Bits | 106848 |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 35616 |  |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,6} for i from {1,…,19,22,…,39} | Bits | 111936 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 75.318 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.2-8: PDSCH Reference Channel for TDD PMI reporting requirements with UL-DL pattern FR1.30-1 (16QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-8.1 TDD | R.PDSCH.2-8.2 TDD | R.PDSCH.2-8.3 TDD |  |  |
| Channel bandwidth | MHz | 40 | 40 | 40 |  |  |
| Subcarrier spacing | kHz | 30 | 30 | 30 |  |  |
| Allocated resource blocks | PRBs | 106 | 106 | 106 |  |  |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 |  |  |
| Allocated slots per 2 frames |  | 23 | 23 | 23 |  |  |
| MCS table |  | 64QAM | 64QAM | 64QAM |  |  |
| MCS index |  | 13 | 13 | 20 |  |  |
| Modulation |  | 16QAM | 16QAM | 64QAM |  |  |
| Target Coding Rate |  | 0.48 | 0.48 | 0.55 |  |  |
| Number of MIMO layers |  | 1 | 2 | 2 |  |  |
| Number of DMRS REs (Note 3) |  | 24 | 24 | 24 |  |  |
| Overhead for TBS determination |  | 0 | 0 | 0 |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A |  |  |
| For CSI-RS Slot i, if mod(i,10) =1 for i from {0,…,39} | Bits | N/A | N/A | N/A |  |  |
| For Slot i = 20 | Bits | 24576 | 49176 | 83976 |  |  |
| For Slot i, if mod(i, 10) = {0,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 24576 | 49176 | 83976 |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A |  |  |
| For CSI-RS Slot i, if mod(i,10) =1 for i from {0,…,39} | Bits | N/A | N/A | N/A |  |  |
| For Slot i = 20 | Bits | 24 | 24 | 24 |  |  |
| For Slot i, if mod(i, 10) = {0,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 24 | 24 | 24 |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A |  |  |
| For CSI-RS Slot i, if mod(i,10) =1 for i from {0,…,39} | CBs | N/A | N/A | N/A |  |  |
| For Slot i = 20 | CBs | 3 | 6 | 10 |  |  |
| For Slot i, if mod(i, 10) = {0,2,3,4,5,6} for i from {1,…,19,22,…,39} | CBs | 3 | 6 | 10 |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A |  |  |
| For CSI-RS Slot i, if mod(i,10) =1 for i from {0,…,39} | Bits | N/A | N/A | N/A |  |  |
| For Slot i = 20 | Bits | 48336 | 96672 | 145008 |  |  |
| For Slot i, if mod(i, 10) = {0,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 50880 | 101760 | 152640 |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 28.2624 | 56.5524 | 96.5724 |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data. | | | | | | |

Table A.3.2.2.2-9: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-4 (64QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-9.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 51 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {4,5} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 3 for i from {0,…,39} |  | 4 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,6,7,8,9} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 31 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 19 |  |  |  |  |
| Modulation |  | 64QAM |  |  |  |  |
| Target Coding Rate |  | 0.51 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {4,5} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 3 for i from {0,…,39} |  | 6 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,6,7,8,9} for i from {1,…,39} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {4,5} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 3 for i from {0,…,39} | Bits | 13064 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,6,7,8,9} for i from {1,…,39} | Bits | 40976 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {4,5} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 3 for i from {0,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,6,7,8,9} for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {4,5} for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 3 for i from {0,…,39} | CBs | 2 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,6,7,8,9} for i from {1,…,39} | CBs | 5 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {4,5} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slots i = 20, 21 | Bits | 77112 |  |  |  |  |
| For Slot i, if mod(i, 10) = 3 for i from {0,…,39} | Bits | 25704 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,6,7,8,9} for i from {1,…,19,22,…,39} | Bits | 80784 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 57.930 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.2.2-10: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 and HST scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-10.1 TDD | R.PDSCH.2-10.2 TDD | R.PDSCH.2-10.3 TDD | R.PDSCH.2-10.4 TDD | R.PDSCH.2-10.5 TDD |
| Channel bandwidth | MHz | 40 | 40 | 40 | 40 | 40 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 106 | 106 | 106 | 106 | 106 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | N/A | 4 | N/A | 4 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames |  | 31 | 27 | 31 | 27 | 31 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 13 | 17 | 13 | 17 |
| Modulation |  | 16QAM | 16QAM | 64QAM | 16QAM | 64QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.43 | 0.48 | 0.43 |
| Number of MIMO layers |  | 1 | 1 | 1 | 2 | 2 |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | N/A | 6 | N/A | 6 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 18 | 18 | 18 | 18 | 18 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 8456 | N/A | 11528 | N/A | 19464 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 25608 | 25608 | 33816 | 51216 | 58384 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 | N/A | 24 | N/A | 24 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 2 | N/A | 2 | N/A | 3 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 4 | 4 | 5 | 7 | 7 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,2,21,22 | Bits | 52176 | 50880 | 76320 | 104304 | 156456 |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 17808 | N/A | 26712 | N/A | 53424 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,20,23,…,39} | Bits | 53424 | 53424 | 80136 | 106848 | 160272 |
| Max. Throughput averaged over 2 frames | Mbps | 36.262 | 34.5708 | 47.9572 | 69.1416 | 82.7112 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.2.2-11: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-5

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-11.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 40 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,39} |  | 12 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,39} |  | 10 |  |  |  |  |
| Allocated slots per 2 frames |  | 31 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 4 |  |  |  |  |
| Modulation |  | QPSK |  |  |  |  |
| Target Coding Rate |  | 0.30 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,39} |  | 18 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,39} |  | 18 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,39} | Bits | 8064 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,39} | Bits | 6528 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,39} | CBs | 1 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,39} | CBs | 1 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i = 20 | Bits | 25440 |  |  |  |  |
| For Slot i = 21 | Bits | 20352 |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,19,22,…,39} | Bits | 26712 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,19,22,…,39} | Bits | 21624 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 6.893 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.2.2-12: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-6

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-12.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 40 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,39} |  | 12 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,39} |  | 8 |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {0,…,39} |  | 10 |  |  |  |  |
| Allocated slots per 2 frames |  | 31 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 4 |  |  |  |  |
| Modulation |  | QPSK |  |  |  |  |
| Target Coding Rate |  | 0.30 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,39} |  | 18 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,39} |  | 18 |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {0,…,39} |  | 18 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,39} | Bits | 8064 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,39} | Bits | 4992 |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {0,…,39} | Bits | 6528 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {0,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,39} | CBs | 1 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {0,…,39} | CBs | 1 |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {0,…,39} | CBs | 1 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i = 20 | Bits | 25440 |  |  |  |  |
| For Slot i = 21 | Bits | 15264 |  |  |  |  |
| For Slot i, if mod(i, 4) = 0 for i from {1,…,19,22,…,39} | Bits | 26712 |  |  |  |  |
| For Slot i, if mod(i, 4) = 1 for i from {1,…,19,22,…,39} | Bits | 16536 |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {0,…,39} | Bits | 21624 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 9.389 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.2.2-13: PDSCH Reference Channel for TDD CC with UL-DL pattern FR1.30-1 and CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-13.1 TDD | R.PDSCH.2-13.2 TDD | R.PDSCH.2-13.3 TDD | R.PDSCH.2-13.4 TDD | R.PDSCH.2-13.5 TDD |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 | 25 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 11 | 24 | 38 | 51 | 65 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 | 4 | 4 | 4 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames |  | 31 | 31 | 31 | 31 | 31 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 | 13 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 6 | 6 | 6 | 6 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 1800 | 3840 | 6144 | 8192 | 10504 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 5504 | 12040 | 18960 | 25608 | 32776 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 16 | 24 | 24 | 24 | 24 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 1 | 1 | 1 | 1 | 2 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 1 | 2 | 3 | 4 | 4 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 20, 21 | Bits | 11088 | 24192 | 38304 | 51408 | 65520 |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 3696 | 8064 | 12768 | 17136 | 21840 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 11616 | 25344 | 40128 | 53856 | 68640 |
| Max. Throughput averaged over 2 frames | Mbps | 7.790 | 17.022 | 26.825 | 36.209 | 46.348 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.2.2-14: PDSCH Reference Channel for TDD CC with UL-DL pattern FR1.30-1 and CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-14.1 TDD | R.PDSCH.2-14.2 TDD | R.PDSCH.2-14.3 TDD | R.PDSCH.2-14.4 TDD | R.PDSCH.2-14.5 TDD |
| Channel bandwidth | MHz | 30 | 50 | 60 | 80 | 90 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 78 | 133 | 162 | 217 | 245 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 | 4 | 4 | 4 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames |  | 31 | 31 | 31 | 31 | 31 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 | 13 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 6 | 6 | 6 | 6 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 12552 | 21504 | 26120 | 34816 | 38936 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 38936 | 67584 | 81976 | 110632 | 122976 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 | 24 | 24 | 24 | 24 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 2 | 3 | 4 | 5 | 5 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 5 | 9 | 10 | 14 | 15 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 20, 21 | Bits | 78624 | 134064 | 163296 | 218736 | 246960 |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 26208 | 44688 | 54432 | 72912 | 82320 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 82368 | 140448 | 171072 | 229152 | 258720 |
| Max. Throughput averaged over 2 frames | Mbps | 55.074 | 95.539 | 115.892 | 156.316 | 173.805 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.2.2-15: PDSCH Reference Channel for TDD CC with UL-DL pattern FR1.30-1 and CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-15.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 273 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 31 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 44040 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 139376 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 6 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 17 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slots i = 20, 21 | Bits | 275184 |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 91728 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 288288 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 196.966 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

**Table A.3.2.2.2-16: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-16.1 TDD | R.PDSCH.2-16.2 TDD |  |  |  |
| Channel bandwidth | MHz | 40 | 40 |  |  |  |
| Subcarrier spacing | kHz | 30 | 30 |  |  |  |
| Allocated resource blocks | PRBs | 106 | 106 |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0, 7} for i from {0,…,39} |  | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 |  |  |  |
| Allocated slots per 2 frames |  | 24 | 24 |  |  |  |
| MCS table |  | 64QAMLowSE | 64QAMLowSE |  |  |  |
| MCS index |  | 19 | 19 |  |  |  |
| Modulation |  | 16QAM | 16QAM |  |  |  |
| Target Coding Rate |  | 0.54 | 0.54 |  |  |  |
| Number of MIMO layers |  | 1 | 1 |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0, 7} for i from {0,…,39} |  | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 |  |  |  |
| Overhead for TBS determination |  | 0 | 0 |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,7,8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,5,6} for i from {1,…,39} | Bits | 30216 | 30216 |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,7,8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,7,8,9} for i from {0,…,39} | CBs | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,5,6} for i from {1,…,39} | CBs | 2 | 4 |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,7,8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slot i = 21 | Bits | 53424 | 50880 |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 55968 | 55968 |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 18.130 (NOTE 3) | 18.130 (NOTE 3) |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: Throughput is calculated under assumption of aggregation factor 2.  Note 4: Throughput is calculated under assumption of repetition number 2. | | | | | | |

**Table A.3.2.2.2-17: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-2**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-17.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 40 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} |  | 2 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} |  | N/A |  |  |  |  |
| Allocated slots per 2 frames |  | 8 |  |  |  |  |
| MCS table |  |  |  |  |  |  |
| MCS index |  | 4 |  |  |  |  |
| Modulation |  | QPSK |  |  |  |  |
| Target Coding Rate |  | 0.3 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} |  | 6 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} |  | N/A |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | Bits | 1160 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | Bits | N/A |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | Bits | 16 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | Bits | N/A |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | CBs | 1 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | CBs | N/A |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | Bits | 3816 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | Bits | N/A |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 0.464 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.2.2-18: PDSCH Reference Channel for PDSCH on band with shared spectrum access with TDD UL-DL pattern FR1.30-7

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | |
| Reference channel |  | R.PDSCH.2-18.1 TDD | R.PDSCH.2-18.2 TDD | R.PDSCH.2-18.3 TDD | R.PDSCH.2-18.4 TDD |
| Channel bandwidth | MHz | 20 | 40 | 60 | 80 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 51 | 106 | 162 | 217 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) =7 for i from {0,…,39} |  | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {3, 5, 6} for i from {1,…,39} (Note 3, 5) | symbol | {4,7,10,12} | {4,7,10,12} | {4,7,10,12} | {4,7,10,12} |
| For Slot i, if mod(i, 10) = {0, 1, 2, 4} for i from {1,…,39} (Note 5) | symbol | 12 | 12 | 12 | 12 |
| 3  Allocated slots per 2 frames | slot | 31 | 31 | 31 | 31 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {3, 5, 6} for i from {1,…,39} (Note 3, 5) | symbol | {6, 6,12,12} | {6, 6,12,12} | {6, 6,12,12} | {6, 6,12,12} |
| For Slot i, if mod(i, 10) = {0, 1, 2, 4} for i from {1,…,39} (Note 5) | symbol | 12 | 12 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {3, 5, 6} for i from {1,…,39} (Note 3, 5) | Bits | {8192,14088， 16392,25608} | {16896,29192,44040,53288} | {26120,45096, 67584,81976,} | {34816,60456, 90176,110632} |
| For Slot i, if mod(i, 10) = {0, 1, 2, 4} for i from {1,…,39} (Note 5) | Bits | 25608 | 53288 | 81976 | 110632 |
| Transport block CRC per Slot |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} (Note 5) | Bits | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {3, 5, 6} for i from {1,…,39} (Note 3, 5) | CBs | {1,2,4,4} | {3,4,6,7} | {4,6,9,10} | {5,8,11,14} |
| For Slot i, if mod(i, 10) = {0, 1, 2, 4} for i from {1,…,39} (Note 5) | CBs | 4 | 7 | 10 | 14 |
| Binary Channel Bits Per Slot |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {3, 5, 6} for i from {1,…,39} (Note 3, 5) | Bits | {17136,29376,44064,53865} | {35616,61056,91854,11193} | {54432,93312,  139968,171072} | {72912,124992,187488,229152} |
| For Slot i, if mod(i, 10) = {0, 1, 2, 4} for i from {1,…,39} (Note 5) | Bits | 53865 | 111936 | 171073 | 229152 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: For {a1,a2,a3,a4 }, a1, a2, a3 and a4 stand for the setup when the number of OFDM symbols is 6,9,12,14 respectively. It applies only to the last slot within the Downlink Transmission duration (specified in Annex B.5). For all other slots the setup when the number of OFDM symbols is 14 should apply.  Note 4: The slot i, mod (i,10)=9 is idle slot with no UL transmission.  Note 5: The per Slot value applies only to slots included within the Downlink Transmission duration. For all other slots not included in the Downlink Transmission Duration, N/A should apply | | | | | |

Table A.3.2.2.2-19: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 and HST-SFN with CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-19.1 TDD | R.PDSCH.2-19.2 TDD | R.PDSCH.2-19.3 TDD | R.PDSCH.2-19.4 TDD | R.PDSCH.2-19.5 TDD |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 | 25 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 11 | 24 | 38 | 51 | 65 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames |  | 27 | 27 | 27 | 27 | 27 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 | 13 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 18 | 18 | 18 | 18 | 18 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 5248 | 11528 | 18432 | 24576 | 31240 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 1 | 2 | 3 | 3 | 4 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,2,21,22 (Note 3) | Bits | 10560 | 23040 | 36480 | 48960 | 63024 |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,20,23,…,39} | Bits | 11088 | 24192 | 38304 | 51408 | 65520 |
| Max. Throughput averaged over 2 frames | Mbps | 7.0848 | 15.5628 | 24.8832 | 33.1776 | 42.174 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52. | | | | | | |

Table A.3.2.2.2-20: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 and HST-SFN with CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-20.1 TDD | R.PDSCH.2-20.2 TDD | R.PDSCH.2-20.3 TDD | R.PDSCH.2-20.4 TDD | R.PDSCH.2-20.5 TDD |
| Channel bandwidth | MHz | 30 | 50 | 60 | 80 | 90 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 78 | 133 | 162 | 217 | 245 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames |  | 27 | 27 | 27 | 27 | 27 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 | 13 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 18 | 18 | 18 | 18 | 18 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 37896 | 64552 | 77896 | 104496 | 118896 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 5 | 8 | 10 | 13 | 15 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,2,21,22 (Note 3) | Bits | 76128 | 131568 | 160800 | 216240 | 244464 |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,20,23,…,39} | Bits | 78624 | 134064 | 163296 | 218736 | 246960 |
| Max. Throughput averaged over 2 frames | Mbps | 51.1596 | 87.1452 | 105.1596 | 141.0696 | 160.5096 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52. | | | | | | |

Table A.3.2.2.2-21: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 and HST-SFN with CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-21.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 273 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 27 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 18 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 131176 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 16 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slots i = 1,2,21,22 (Note 3) | Bits | 272688 |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,20,23,…,39} | Bits | 275184 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 177.0876 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52. | | | | | | |

Table A.3.2.2.2-22: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 and HST-DPS with CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-22.1 TDD | R.PDSCH.2-22.2 TDD | R.PDSCH.2-22.3 TDD | R.PDSCH.2-22.4 TDD | R.PDSCH.2-22.5 TDD |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 | 25 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 11 | 24 | 38 | 51 | 65 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 | 4 | 4 | 4 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames |  | 31 | 31 | 31 | 31 | 31 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 17 | 17 | 17 | 17 | 17 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 6 | 6 | 6 | 6 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 18 | 18 | 18 | 18 | 18 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 2408 | 5120 | 8192 | 11016 | 14088 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 7040 | 15624 | 24576 | 32776 | 42016 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 | 24 | 24 | 24 | 24 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 1 | 1 | 1 | 2 | 2 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 1 | 2 | 3 | 4 | 5 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,2,21,22 (Note 3) | Bits | 15840 | 34560 | 54720 | 73440 | 94536 |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 5544 | 12096 | 19152 | 25704 | 32760 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,20,23,…,39} | Bits | 16632 | 36288 | 57456 | 77112 | 98280 |
| Max. Throughput averaged over 2 frames | Mbps | 9.9856 | 22.1164 | 34.816 | 46.4508 | 59.5392 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52. | | | | | | |

Table A.3.2.2.2-23: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 and HST-DPS with CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-23.1 TDD | R.PDSCH.2-23.2 TDD | R.PDSCH.2-23.3 TDD | R.PDSCH.2-23.4 TDD | R.PDSCH.2-23.5 TDD |
| Channel bandwidth | MHz | 30 | 50 | 60 | 80 | 90 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 78 | 133 | 162 | 217 | 245 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 | 4 | 4 | 4 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames |  | 31 | 31 | 31 | 31 | 31 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 17 | 17 | 17 | 17 | 17 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 6 | 6 | 6 | 6 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 18 | 18 | 18 | 18 | 18 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 16896 | 28680 | 34816 | 47112 | 53288 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 50184 | 86040 | 104496 | 139376 | 159880 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 | 24 | 24 | 24 | 24 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 3 | 4 | 5 | 6 | 7 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 6 | 11 | 13 | 17 | 19 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,2,21,22 (Note 3) | Bits | 114192 | 197352 | 241200 | 324360 | 366696 |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 39312 | 67032 | 81648 | 109368 | 123480 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,20,23,…,39} | Bits | 117936 | 201096 | 244944 | 328104 | 370440 |
| Max. Throughput averaged over 2 frames | Mbps | 71.1276 | 121.89 | 148.0328 | 197.58 | 226.4956 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52. | | | | | | |

Table A.3.2.2.2-24: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 and HST-DPS with CA scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-24.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 273 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 31 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 17 |  |  |  |  |
| Modulation |  | 64QAM |  |  |  |  |
| Target Coding Rate |  | 0.43 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 18 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 58384 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 176208 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 7 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 21 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slots i = 1,2,21,22 (Note 3) | Bits | 409032 |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 137592 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,20,23,…,39} | Bits | 412776 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 249.5576 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52. | | | | | | |

Table A.3.2.2.2-25: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 (1024QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-25.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 40 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 31 |  |  |  |  |
| MCS table |  | 1024QAM |  |  |  |  |
| MCS index |  | 23 |  |  |  |  |
| Modulation |  | 1024QAM |  |  |  |  |
| Target Coding Rate |  | 0.79 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 34816 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 110632 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 5 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 14 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slots i = 20, 21 | Bits | 133560 |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 44520 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 139920 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 156.316 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.2-26: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 (16QAM)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | | |
| Reference channel |  | R.PDSCH.2-26.1 TDD |  |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |  |
| Allocated resource blocks | PRBs | 51 |  |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |  |
| Allocated slots per 2 frames |  | 31 |  |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |  |
| Number of DMRS Res |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 4096 |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 12808 |  |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6}for i from {1,…,39} | Bits | 24 |  |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 1 |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 2 |  |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |  |
| For Slots i = 20, 21 | Bits | 25704 |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 8568 |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 26928 |  |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 18.110 |  |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |  |

Table A.3.2.2.2-27: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 (64QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-27.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 51 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 31 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 19 |  |  |  |  |
| Modulation |  | 64QAM |  |  |  |  |
| Target Coding Rate |  | 0.51 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 13064 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 40976 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6}for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 2 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 5 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slots i = 20, 21 | Bits | 77112 |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 25704 |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 80784 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 57.930 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: PDSCH is scheduled in PRB numbers from 0 to 52.  Note 4: PDSCH is scheduled in PRB numbers from 53 to 105. | | | | | | |

Table A.3.2.2.2-28

FFS

Table A.3.2.2.2-29: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 with overlapping spectrum for LTE and NR for inter-RAT measurement enabled

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-29.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 51 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots i={5,6,16,25,26,36,45,46,56,65,66,76} |  | N/A |  |  |  |  |
| For Slots i={0,40} |  | N/A |  |  |  |  |
| For i,if mod(i,10)={8,9} |  | N/A |  |  |  |  |
| For Slots in meauresment gap i= {2,3,4,5,6,7,8,9,10,11,12,13} |  | N/A |  |  |  |  |
| For i,if mod(i,10)=7 and i≠7 |  | 4 |  |  |  |  |
| For i, if mod(I,10)={0,1,2,3,4,5,6} and i ≠{0,2,3,4,5,6,10,11,12,13,16,25,26,36,40,45,46,56,65,66,76} |  | 12 |  |  |  |  |
| Allocated slots per 4 frames |  |  |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots i={5,6,16,25,26,36,45,46,56,65,66,76} |  | N/A |  |  |  |  |
| For Slots i={0,40} |  | N/A |  |  |  |  |
| For i,if mod(i,10)={8,9} |  | N/A |  |  |  |  |
| For Slots in meauresment gap i= {2,3,4,5,6,7,8,9,10,11,12,13} |  | N/A |  |  |  |  |
| For i,if mod(i,10)=7 and i≠7 |  | 4 |  |  |  |  |
| For i, if mod(I,10)={0,1,2,3,4,5,6} and i ≠{0,2,3,4,5,6,10,11,12,13,16,25,26,36,40,45,46,56,65,66,76} |  | 12 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots i={5,6,16,25,26,36,45,46,56,65,66,76} |  | N/A |  |  |  |  |
| For Slots i={0,40} |  | N/A |  |  |  |  |
| For i,if mod(i,10)={8,9} |  | N/A |  |  |  |  |
| For Slots in meauresment gap i= {2,3,4,5,6,7,8,9,10,11,12,13} |  | N/A |  |  |  |  |
| For i,if mod(i,10)=7 and i≠7 |  | 8456 |  |  |  |  |
| For i, if mod(I,10)={0,1,2,3,4,5,6} and i ≠{0,2,3,4,5,6,10,11,12,13,16,25,26,36,40,45,46,56,65,66,76} |  | 12808 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots i={5,6,16,25,26,36,45,46,56,65,66,76} |  | N/A |  |  |  |  |
| For Slots i={0,40} |  | N/A |  |  |  |  |
| For i,if mod(i,10)={8,9} |  | N/A |  |  |  |  |
| For Slots in meauresment gap i= {2,3,4,5,6,7,8,9,10,11,12,13} |  | N/A |  |  |  |  |
| For i,if mod(i,10)=7 and i≠7 |  | 2 |  |  |  |  |
| For i, if mod(I,10)={0,1,2,3,4,5,6} and i ≠{0,2,3,4,5,6,10,11,12,13,16,25,26,36,40,45,46,56,65,66,76} |  | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots i={5,6,16,25,26,36,45,46,56,65,66,76} |  | N/A |  |  |  |  |
| For Slots i={0,40} |  | N/A |  |  |  |  |
| For i,if mod(i,10)={8,9} |  | N/A |  |  |  |  |
|  |  | N/A |  |  |  |  |
| For i,if mod(i,10)=7 and i≠7 |  | 17808 |  |  |  |  |
| For i={20,21,60,61} |  | 25776 |  |  |  |  |
| For i, if mod(I,10)={0,1,2,3,4,5,6} and i ≠{0,2,3,4,5,6,10,11,12,13,16,25,26,36,40,45,46,56,65,66,76} |  | 26928 |  |  |  |  |
| Max. Throughput averaged over 4frames | Mbps | 12.6868 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 4 frames  Note 3: No user data is scheduled on slots with PBCH/PSS/SSS on the interference LTE cell  Note 4: No user data is scheduled on slots used for measurement | | | | | | |

Table A.3.2.2.2-30: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 and HST scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-30.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 40 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 27 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 18 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 51216 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 7 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slots i = 1,2,21,22 (Note 3) | Bits | 101856 |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,20,23,…,39} | Bits | 106848 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 69.1416 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation. | | | | | | |

#### A.3.2.2.3 Reference measurement channels for SCS 60 kHz FR1

#### A.3.2.2.4 Reference measurement channels for SCS 60 kHz FR2

Table A.3.2.2.4-1: PDSCH Reference Channel for TDD UL-DL pattern FR2.60-1 (16QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.4-1.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 50 |  |  |  |  |
| Subcarrier spacing | kHz | 60 |  |  |  |  |
| Allocated resource blocks | PRBs | 66 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,79} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 79} |  | 10 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,79} |  | 13 |  |  |  |  |
| Allocated slots per 2 frames |  | 59 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,79} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 79} |  | 12 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,79} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 6 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,79} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 79} | Bits | 25608 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,79} | Bits | 34816 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,79} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 79} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,79} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,79} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 79} | CBs | 4 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,79} | CBs | 5 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,79} | Bits | N/A |  |  |  |  |
| For Slot i = 40, 41 | Bits | 69960 |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {4,…, 79} | Bits | 54912 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,39,42,…,79} | Bits | 73128 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 93.499 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

#### A.3.2.2.5 Reference measurement channels for SCS 120 kHz FR2

Table A.3.2.2.5-1: PDSCH Reference Channel for TDD UL-DL pattern FR2.120-1 and FR2.120-1A (QPSK)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.5-1.1 TDD | R.PDSCH.5-1.2 TDD |  |  |  |
| Channel bandwidth | MHz | 100 | 100 |  |  |  |
| Subcarrier spacing | kHz | 120 | 120 |  |  |  |
| Allocated resource blocks | PRBs | 66 | 66 |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} |  | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 9 | 2 |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} |  | 13 | 2 |  |  |  |
| Allocated slots per 2 frames |  | 127 | 127 |  |  |  |
| MCS table |  | 64QAM | 64QAM |  |  |  |
| MCS index |  | 4 | 4 |  |  |  |
| Modulation |  | QPSK | QPSK |  |  |  |
| Target Coding Rate |  | 0.30 | 0.30 |  |  |  |
| Number of MIMO layers |  | 1 | 1 |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} |  | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 12 | 6 |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} |  | 12 | 6 |  |  |  |
| Overhead for TBS determination |  | 6 | 0 |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 3624 | 736 |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | Bits | 5504 | 736 |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 16 | 16 |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | Bits | 24 | 16 |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | CBs | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | CBs | 1 | 1 |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | CBs | 1 | 1 |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A |  |  |  |
| For Slots i = 80, 81 | Bits | 17490 | 2310 |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 12210 | 2310 |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,79,82,…,159} | Bits | 18282 | 2310 |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 31.942 | 4.673 |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.5-2: PDSCH Reference Channel for TDD UL-DL pattern FR2.120-1 (16QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.5-2.1 TDD | R.PDSCH.5-2.2 TDD | R.PDSCH.5-2.3 TDD |  |  |
| Channel bandwidth | MHz | 100 | 100 | 200 |  |  |
| Subcarrier spacing | kHz | 120 | 120 | 120 |  |  |
| Allocated resource blocks | PRBs | 66 | 66 | 132 |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} |  | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 9 | 9 | 9 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} |  | 13 | 13 | 13 |  |  |
| Allocated slots per 2 frames |  | 127 | 127 | 127 |  |  |
| MCS table |  | 64QAM | 64QAM | 64QAM |  |  |
| MCS index |  | 13 | 13 | 13 |  |  |
| Modulation |  | 16QAM | 16QAM | 16QAM |  |  |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 |  |  |
| Number of MIMO layers |  | 1 | 2 | 2 |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} |  | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 12 | 12 | 12 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} |  | 12 | 12 | 12 |  |  |
| Overhead for TBS determination |  | 6 | 6 | 6 |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 11272 | 22536 | 45096 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | Bits | 17424 | 34816 | 69672 |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 24 | 24 | 24 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | Bits | 24 | 24 | 24 |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | CBs | N/A | N/A | N/A |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | CBs | 2 | 3 | 6 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | CBs | 3 | 5 | 9 |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A | N/A |  |  |
| For Slots i = 80, 81 | Bits | 36564 | 69960 | 139920 |  |  |
| For Slots i = 82, 83 | Bits | 34980 | 73128 | 146256 |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 24420 | 48840 | 97680 |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,79,84,…,159} | Bits | 36564 | 73128 | 146256 |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 100.799 | 201.434 | 403.096 |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.5-3: PDSCH Reference Channel for TDD UL-DL pattern FR2.120-1 (64QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.5-3.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |
| Allocated resource blocks | PRBs | 66 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 9 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} |  | 13 |  |  |  |  |
| Allocated slots per 2 frames |  | 127 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 18 |  |  |  |  |
| Modulation |  | 64QAM |  |  |  |  |
| Target Coding Rate |  | 0.46 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 12 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 6 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 16136 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | Bits | 25104 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | CBs | 2 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | CBs | 3 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slots i = 80, 81 | Bits | 52470 |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 36630 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,79,82,…,159} | Bits | 54846 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 145.062 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.5-4: PDSCH Reference Channel for TDD UL-DL pattern FR2.120-2 (QPSK)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.5-4.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |
| Allocated resource blocks | PRBs | 6 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} |  | 10 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} |  | 13 |  |  |  |  |
| Allocated slots per 2 frames |  | 119 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 4 |  |  |  |  |
| Modulation |  | QPSK |  |  |  |  |
| Target Coding Rate |  | 0.30 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} |  | 12 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 6 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} | Bits | 736 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} | Bits | 1032 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} | Bits | 16 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} | Bits | 16 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} | CBs | 1 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} | CBs | 1 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i = 80, 81 | Bits | 3180 |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {4,…, 159} | Bits | 2496 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,79,82,…,159} | Bits | 3324 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 5.548 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.5-5: PDSCH Reference Channel for TDD UL-DL pattern FR2.120-2 (16QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.5-5.1 TDD | R.PDSCH.5-5.2 TDD |  |  |  |
| Channel bandwidth | MHz | 100 | 50 |  |  |  |
| Subcarrier spacing | kHz | 120 | 120 |  |  |  |
| Allocated resource blocks | PRBs | 66 | 32 |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} |  | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} |  | 10 | 10 |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} |  | 13 | 13 |  |  |  |
| Allocated slots per 2 frames |  | 119 | 119 |  |  |  |
| MCS table |  | 64QAM | 64QAM |  |  |  |
| MCS index |  | 13 | 13 |  |  |  |
| Modulation |  | 16QAM | 16QAM |  |  |  |
| Target Coding Rate |  | 0.48 | 0.48 |  |  |  |
| Number of MIMO layers |  | 2 | 2 |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} |  | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} |  | 12 | 12 |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} |  | 12 | 12 |  |  |  |
| Overhead for TBS determination |  | 6 | 6 |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} | Bits | 25608 | 12552 |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} | Bits | 34816 | 16896 |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} | Bits | 24 | 24 |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} | Bits | 24 | 24 |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | CBs | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} | CBs | 4 | 2 |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} | CBs | 5 | 3 |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | Bits | N/A | N/A |  |  |  |
| For Slot i = 80, 81 | Bits | 69960 | 33920 |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {4,…, 159} | Bits | 54912 | 26624 |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,79,82,…,159} | Bits | 73128 | 35456 |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 188.739 | 91.843 |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.5-6: PDSCH Reference Channel for TDD UL-DL pattern FR2.120-2 (64QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.5-6.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |
| Allocated resource blocks | PRBs | 66 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} |  | 10 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} |  | 13 |  |  |  |  |
| Allocated slots per 2 frames |  | 119 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 17 |  |  |  |  |
| Modulation |  | 64QAM |  |  |  |  |
| Target Coding Rate |  | 0.43 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} |  | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} |  | 12 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 6 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} | Bits | 34816 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} | Bits | 47112 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {1,…, 159} | CBs | 5 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,159} | CBs | 6 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = 3 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i = 80, 81 | Bits | 114940 |  |  |  |  |
| For Slot i, if mod(i, 4) = 2 for i from {4,…, 159} | Bits | 82368 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {1,…,79,82,…,159} | Bits | 109692 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 255.724 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames. | | | | | | |

Table A.3.2.2.5-7: PDSCH Reference Channel for TDD PMI reporting requirements with UL-DL pattern FR2.120-1 (16QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.5-7.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |
| Allocated resource blocks | PRBs | 66 |  |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 63 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs (Note 3) |  | 24 |  |  |  |  |
| Overhead for TBS determination |  | 6 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = {3,4} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For CSI-RS Slot i, if mod(i,5) =1 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i = 80 | Bits | 14344 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,2} for i from {1,…, 79,82,…,159} | Bits | 14344 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = {3,4} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For CSI-RS Slot i, if mod(i, 5) =1 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i = 80 | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,2} for i from {1,…,79,82,…,159} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = {3,4} for i from {0,…,159} | CBs | N/A |  |  |  |  |
| For CSI-RS Slot i, if mod(i, 5) =1 for i from {0,…,159} | CBs | N/A |  |  |  |  |
| For Slot i = 80 | CBs | 2 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,2} for i from {1,…,79,82,…,159} | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = {3,4} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For CSI-RS Slot i, if mod(i, 5) =1 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i = 80 | Bits | 28776 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,2} for i from {1,…,79,82,…,159} | Bits | 30360 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 45.1836 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data. | | | | | | |

Table A.3.2.2.5-8: PDSCH Reference Channel for TDD PMI reporting requirements with UL-DL pattern FR2.120-2 (16QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.5-8.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |
| Allocated resource blocks | PRBs | 66 |  |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 59 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs (Note 3) |  | 24 |  |  |  |  |
| Overhead for TBS determination |  | 6 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For CSI-RS Slot i, if mod(i, 8) =1 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i = 80 | Bits | 14344 |  |  |  |  |
| For Slot i, if mod(i, 8) = {0,4,5} for i from {1,…,79,82,…,159} | Bits | 14344 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For CSI-RS Slot i, if mod(i, 8) =1 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i = 80 | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 8) = {0,4,5,} for i from {1,…,79,82,…,159} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,159} | CBs | N/A |  |  |  |  |
| For CSI-RS Slot i, if mod(i, 8) =1 for i from {0,…,159} | CBs | N/A |  |  |  |  |
| For Slot i = 80 | CBs | 2 |  |  |  |  |
| For Slot i, if mod(i, 8) = {0,4,5} for i from {1,…,79,82,…,159} | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For CSI-RS Slot i, if mod(i, 8) =1 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i = 80 | Bits | 28776 |  |  |  |  |
| For Slot i, if mod(i, 8) = {0,4,5}for i from {1,…,79,82,…,159} | Bits | 30360 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 42.3148 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data. | | | | | | |

Table A.3.2.2.5-9: PDSCH Reference Channel for TDD CC with UL-DL pattern FR2.120-1 and CA scenario

FFS

Table A.3.2.2.5-10: PDSCH Reference Channel for TDD UL-DL pattern FR2.120-1 (256QAM)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.5-10.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 50 |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |
| Allocated resource blocks | PRBs | 32 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 9 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} |  | 13 |  |  |  |  |
| Allocated slots per 2 frames |  | 127 |  |  |  |  |
| MCS table |  | 256QAM |  |  |  |  |
| MCS index |  | 20 |  |  |  |  |
| Modulation |  | 256QAM |  |  |  |  |
| Target Coding Rate |  | 0.67 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 12 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 6 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 15368 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | Bits | 23568 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | CBs | 2 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | CBs | 3 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slots i = 80, 81 | Bits | 33920 |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 23680 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,79,82,…,159} | Bits | 35456 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 136.537 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.2.5-11: PDSCH Reference Channel for TDD UL-DL pattern FR2.120-2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.5-11.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |
| Allocated resource blocks | PRBs | 66 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} |  | 13 |  |  |  |  |
| Allocated slots per 2 frames |  | 78 |  |  |  |  |
| MCS table |  | 64QAMLowSE |  |  |  |  |
| MCS index |  | 16 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.37 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 6 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0, 1 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} | Bits | 13320 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0, 1 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0, 1 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,159} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0,1 and Slot i, if mod(i, 4) = {2, 3} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i = 80, 81 | Bits | 34980 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} | Bits | 36564 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 25.974 (Note 3) |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: Throughput is calculated under assumption of aggregation factor 2. | | | | | | |

#### A.3.2.2.6 Reference measurement channels for E-UTRA

Table A.3.2.2.6-1: PDSCH Reference Channel for sustained data-rate test (64QAM, 2 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.6-1.1 TDD | R.PDSCH.6-1.2 TDD | R.PDSCH.6-1.3 TDD |  |
| Channel bandwidth | MHz | 10 | 15 | 20 |  |
| Allocated resource blocks |  | Note 7 | Note 8 | Note 9 |  |
| Uplink-Downlink Configuration (Note 3) |  | 2 | 2 | 2 |  |
| Number of HARQ Processes per component carrier |  | 10 | 10 | 10 |  |
| Allocated subframes per Radio Frame (D+S) |  | 6 | 6 | 6 |  |
| Modulation |  | 64QAM | 64QAM | 64QAM |  |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 |  | N/A | N/A | N/A |  |
| For Sub-Frames 3,4,8,9 |  | 0.85 | 0.85 | 0.88 |  |
| For Sub-Frame 5 |  | 0.88 | 0.87 | 0.87 |  |
| For Sub-Frame 0 |  | 0.90 | 0.88 | 0.90 |  |
| Information Bit Payload (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4,8,9 | Bits | 36696 | 55056 | 75376 |  |
| For Sub-Frame 5 | Bits | 35160 | 52752 | 71112 |  |
| For Sub-Frame 0 | Bits | 36696 | 55056 | 75376 |  |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | CBs | N/A | N/A | N/A |  |
| For Sub-Frames 3,4,8,9 | CBs | 6 | 9 | 13 |  |
| For Sub-Frame 5 | CBs | 6 | 9 | 12 |  |
| For Sub-Frame 0 | CBs | 6 | 9 | 13 |  |
| Binary Channel Bits (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4,8,9 | Bits | 43200 | 64800 | 86400 |  |
| For Sub-Frame 5 | Bits | 40176 | 60912 | 82512 |  |
| For Sub-Frame 0 | Bits | 41184 | 62784 | 84384 |  |
| Number of layers |  | 2 | 2 | 2 |  |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 21.864 | 32.803 | 44.799 |  |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: As per Table 4.2-2 in TS 36.211 [15].  Note 4: Given per component carrier per codeword.  Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 6: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,3,4,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,3,4,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,3,4,8,9. | | | | | |

Table A.3.2.2.6-2: PDSCH Reference Channel for sustained data-rate test (64QAM, 4 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.6-2.1 TDD | R.PDSCH.6-2.2 TDD | R.PDSCH.6-2.3 TDD |  |
| Channel bandwidth | MHz | 10 | 15 | 20 |  |
| Allocated resource blocks |  | Note 7 | Note 8 | Note 9 |  |
| Uplink-Downlink Configuration (Note 3) |  | 2 | 2 | 2 |  |
| Number of HARQ Processes per component carrier |  | 10 | 10 | 10 |  |
| Allocated subframes per Radio Frame (D+S) |  | 6 | 6 | 6 |  |
| Modulation |  | 64QAM | 64QAM | 64QAM |  |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 |  | N/A | N/A | N/A |  |
| For Sub-Frames 3,4,8,9 |  | 0.78 | 0.77 | 0.79 |  |
| For Sub-Frame 5 |  | 0.79 | 0.79 | 0.80 |  |
| For Sub-Frame 0 |  | 0.82 | 0.79 | 0.81 |  |
| Information Bit Payload (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4,8,9 | Bits | 63776 | 93800 | 128496 |  |
| For Sub-Frame 5 | Bits | 59256 | 90816 | 124464 |  |
| For Sub-Frame 0 | Bits | 63776 | 93800 | 128496 |  |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | CBs | N/A | N/A | N/A |  |
| For Sub-Frames 3,4,8,9 | CBs | 11 | 16 | 21 |  |
| For Sub-Frame 5 | CBs | 10 | 15 | 21 |  |
| For Sub-Frame 0 | CBs | 11 | 16 | 21 |  |
| Binary Channel Bits (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4,8,9 | Bits | 81600 | 122400 | 163200 |  |
| For Sub-Frame 5 | Bits | 75840 | 115008 | 155808 |  |
| For Sub-Frame 0 | Bits | 77856 | 118656 | 159456 |  |
| Number of layers |  | 4 | 4 | 4 |  |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 37.813 | 55.981 | 76.694 |  |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: As per Table 4.2-2 in TS 36.211 [15].  Note 4: Given per component carrier per codeword.  Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 6: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,3,4,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,3,4,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,3,4,8,9. | | | | | |

Table A.3.2.2.6-3: PDSCH Reference Channel for sustained data-rate test (256QAM, 2 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.6-3.1 TDD | R.PDSCH.6-3.2 TDD | R.PDSCH.6-3.3 TDD |  |
| Channel bandwidth | MHz | 10 | 15 | 20 |  |
| Allocated resource blocks |  | Note 7 | Note 8 | Note 9 |  |
| Uplink-Downlink Configuration (Note 3) |  | 2 | 2 | 2 |  |
| Number of HARQ Processes per component carrier |  | 10 | 10 | 10 |  |
| Allocated subframes per Radio Frame (D+S) |  | 6 | 6 | 6 |  |
| Modulation |  | 256QAM | 256QAM | 256QAM |  |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 |  | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 |  | 0.74 | 0.79 | 0.74 |  |
| For Sub-Frames 8,9 |  | 0.85 | 0.88 | 0.85 |  |
| For Sub-Frame 5 |  | 0.76 | 0.76 | 0.74 |  |
| For Sub-Frame 0 |  | 0.78 | 0.77 | 0.76 |  |
| Information Bit Payload (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | Bits | 42368 | 63776 | 84760 |  |
| For Sub-Frames 8,9 | Bits | 48936 | 75376 | 97896 |  |
| For Sub-Frame 5 | Bits | 40576 | 61664 | 81176 |  |
| For Sub-Frame 0 | Bits | 42368 | 63776 | 84760 |  |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | CBs | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | CBs | 7 | 11 | 14 |  |
| For Sub-Frames 8,9 | CBs | 8 | 13 | 16 |  |
| For Sub-Frame 5 | CBs | 7 | 11 | 14 |  |
| For Sub-Frame 0 | CBs | 7 | 11 | 14 |  |
| Binary Channel Bits (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | Bits | 57600 | 86400 | 115200 |  |
| For Sub-Frames 8,9 | Bits | 57600 | 86400 | 115200 |  |
| For Sub-Frame 5 | Bits | 53568 | 81216 | 110016 |  |
| For Sub-Frame 0 | Bits | 54912 | 83712 | 112512 |  |
| Number of layers |  | 2 | 2 | 2 |  |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 26.555 | 40.374 | 53.125 |  |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: As per Table 4.2-2 in TS 36.211 [15].  Note 4: Given per component carrier per codeword.  Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 6: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,3,4,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,3,4,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,3,4,8,9. | | | | | |

Table A.3.2.2.6-4: PDSCH Reference Channel for sustained data-rate test (256QAM, 4 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.6-4.1 TDD | R.PDSCH.6-4.2 TDD | R.PDSCH.6-4.3 TDD |  |
| Channel bandwidth | MHz | 10 | 15 | 20 |  |
| Allocated resource blocks |  | Note 7 | Note 8 | Note 9 |  |
| Uplink-Downlink Configuration (Note 3) |  | 2 | 2 | 2 |  |
| Number of HARQ Processes per component carrier |  | 10 | 10 | 10 |  |
| Allocated subframes per Radio Frame (D+S) |  | 6 | 6 | 6 |  |
| Modulation |  | 256QAM | 256QAM | 256QAM |  |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 |  | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 |  | 0.78 | 0.79 | 0.78 |  |
| For Sub-Frames 8,9 |  | 0.78 | 0.79 | 0.78 |  |
| For Sub-Frame 5 |  | 0.81 | 0.82 | 0.78 |  |
| For Sub-Frame 0 |  | 0.82 | 0.82 | 0.80 |  |
| Information Bit Payload (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | Bits | 84760 | 128496 | 169544 |  |
| For Sub-Frames 8,9 | Bits | 84760 | 128496 | 169544 |  |
| For Sub-Frame 5 | Bits | 81176 | 124464 | 161760 |  |
| For Sub-Frame 0 | Bits | 84760 | 128496 | 169544 |  |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | CBs | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | CBs | 14 | 21 | 28 |  |
| For Sub-Frames 8,9 | CBs | 14 | 21 | 28 |  |
| For Sub-Frame 5 | CBs | 14 | 21 | 27 |  |
| For Sub-Frame 0 | CBs | 14 | 21 | 28 |  |
| Binary Channel Bits (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | Bits | 108800 | 163200 | 217600 |  |
| For Sub-Frames 8,9 | Bits | 108800 | 163200 | 217600 |  |
| For Sub-Frame 5 | Bits | 101120 | 153344 | 207744 |  |
| For Sub-Frame 0 | Bits | 103808 | 158208 | 212608 |  |
| Number of layers |  | 4 | 4 | 4 |  |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 50.498 | 76.694 | 100.948 |  |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: As per Table 4.2-2 in TS 36.211 [15].  Note 4: Given per component carrier per codeword.  Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 6: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,3,4,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,3,4,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,3,4,8,9. | | | | | |

Table A.3.2.2.6-5: PDSCH Reference Channel for sustained data-rate test (1024QAM, 2 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.6-5.1 TDD | R.PDSCH.6-5.2 TDD | R.PDSCH.6-5.3 TDD |  |
| Channel bandwidth | MHz | 10 | 15 | 20 |  |
| Allocated resource blocks |  | Note 7 | Note 8 | Note 9 |  |
| Uplink-Downlink Configuration (Note 3) |  | 2 | 2 | 2 |  |
| Number of HARQ Processes per component carrier |  | 10 | 10 | 10 |  |
| Allocated subframes per Radio Frame (D+S) |  | 6 | 6 | 6 |  |
| Modulation |  | 1024QAM | 1024QAM | 1024QAM |  |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 |  | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 |  | 0.76 | 0.75 | 0.76 |  |
| For Sub-Frames 8,9 |  | 0.76 | 0.75 | 0.76 |  |
| For Sub-Frame 5 |  | 0.76 | 0.78 | 0.77 |  |
| For Sub-Frame 0 |  | 0.80 | 0.78 | 0.78 |  |
| Information Bit Payload (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | Bits | 55056 | 81176 | 110136 |  |
| For Sub-Frames 8,9 | Bits | 55056 | 81176 | 110136 |  |
| For Sub-Frame 5 | Bits | 51024 | 78704 | 105528 |  |
| For Sub-Frame 0 | Bits | 55056 | 81176 | 110136 |  |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | CBs | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | CBs | 9 | 14 | 18 |  |
| For Sub-Frames 8,9 | CBs | 9 | 14 | 18 |  |
| For Sub-Frame 5 | CBs | 9 | 13 | 18 |  |
| For Sub-Frame 0 | CBs | 9 | 14 | 18 |  |
| Binary Channel Bits (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | Bits | 72000 | 108000 | 144000 |  |
| For Sub-Frames 8,9 | Bits | 72000 | 108000 | 144000 |  |
| For Sub-Frame 5 | Bits | 66960 | 101520 | 137520 |  |
| For Sub-Frame 0 | Bits | 68640 | 104640 | 140640 |  |
| Number of layers |  | 2 | 2 | 2 |  |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 32.630 | 48.458 | 65.621 |  |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: As per Table 4.2-2 in TS 36.211 [15].  Note 4: Given per component carrier per codeword.  Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 6: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,3,4,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,3,4,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,3,4,8,9. | | | | | |

Table A.3.2.2.6-6: PDSCH Reference Channel for sustained data-rate test (1024QAM, 4 MIMO layers)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.PDSCH.6-6.1 TDD | R.PDSCH.6-6.2 TDD | R.PDSCH.6-6.3 TDD |  |
| Channel bandwidth | MHz | 10 | 15 | 20 |  |
| Allocated resource blocks |  | Note 7 | Note 8 | Note 9 |  |
| Uplink-Downlink Configuration (Note 3) |  | 2 | 2 | 2 |  |
| Number of HARQ Processes per component carrier |  | 10 | 10 | 10 |  |
| Allocated subframes per Radio Frame (D+S) |  | 6 | 6 | 6 |  |
| Modulation |  | 1024QAM | 1024QAM | 1024QAM |  |
| Coding Rate |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 |  | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 |  | 0.81 | 0.79 | 0.81 |  |
| For Sub-Frames 8,9 |  | 0.81 | 0.79 | 0.81 |  |
| For Sub-Frame 5 |  | 0.81 | 0.82 | 0.82 |  |
| For Sub-Frame 0 |  | 0.85 | 0.82 | 0.83 |  |
| Information Bit Payload (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | Bits | 110136 | 161760 | 220296 |  |
| For Sub-Frames 8,9 | Bits | 110136 | 161760 | 220296 |  |
| For Sub-Frame 5 | Bits | 101840 | 157432 | 211936 |  |
| For Sub-Frame 0 | Bits | 110136 | 161760 | 220296 |  |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | CBs | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | CBs | 18 | 27 | 36 |  |
| For Sub-Frames 8,9 | CBs | 18 | 27 | 36 |  |
| For Sub-Frame 5 | CBs | 17 | 26 | 35 |  |
| For Sub-Frame 0 | CBs | 18 | 27 | 36 |  |
| Binary Channel Bits (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,6,7 | Bits | N/A | N/A | N/A |  |
| For Sub-Frames 3,4 | Bits | 136000 | 204000 | 272000 |  |
| For Sub-Frames 8,9 | Bits | 136000 | 204000 | 272000 |  |
| For Sub-Frame 5 | Bits | 126400 | 191680 | 259680 |  |
| For Sub-Frame 0 | Bits | 129760 | 197760 | 265760 |  |
| Number of layers |  | 2 | 2 | 2 |  |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 65.252 | 96.623 | 131.342 |  |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [17].  Note 3: As per Table 4.2-2 in TS 36.211 [15].  Note 4: Given per component carrier per codeword.  Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  Note 6: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,3,4,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,3,4,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,3,4,8,9. | | | | | |

#### A.3.2.2.7 Reference measurement channels for Intra-cell Inter-UE interference scenario

Table A.3.2.2.7-1: PDSCH Reference Channel for TDD Intra-cell Inter-UE interference scenario

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.7-1.1 TDD | R.PDSCH.7-1.2 TDD |  |  |  |
| Channel bandwidth | MHz | 40 | 40 |  |  |  |
| Subcarrier spacing | kHz | 30 | 30 |  |  |  |
| Allocated resource blocks | PRBs | 106 | 106 |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 |  |  |  |
| Allocated slots per 2 frames |  | 31 | 31 |  |  |  |
| MCS table |  | 64QAM | 64QAM |  |  |  |
| MCS index |  | 13 | 13 |  |  |  |
| Modulation |  | 16QAM | 16QAM |  |  |  |
| Target Coding Rate |  | 0.48 | 0.48 |  |  |  |
| Number of MIMO layers |  | 1 | 2 |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 12 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 24 |  |  |  |
| Overhead for TBS determination |  | 0 | 0 |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 8456 | 14600 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 26632 | 49176 |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 | 24 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6}for i from {1,…,39} | Bits | 24 | 24 |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 2 | 2 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 4 | 6 |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slots i = 20, 21 | Bits | 53424 | 96672 |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 17808 | 30528 |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 55968 | 101760 |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 37.644 | 69.308 |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

### A.3.2.3 HD-FDD

#### A.3.2.3.1 Reference measurement channels for SCS 15 kHz FR1

Table A.3.2.3.1-1: PDSCH Reference Channel for HD-FDD

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-1.1 HD-FDD | R.PDSCH.1-1.2 HD-FDD | R.PDSCH.1-1.3 HD-FDD | R.PDSCH.1-1.4 HD-FDD | R.PDSCH.1-1.5 HD-FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 |
| Number of allocated resource blocks | PRBs | 52 | 52 | 52 | 52 | 52 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} |  | 8 | 8 | 8 | 8 | 8 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} |  | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames | Slots | 15 | 15 | 15 | 15 | 15 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 256QAM | 256QAM |
| MCS index |  | 4 | 13 | 19 | 20 | 24 |
| Modulation |  | QPSK | 16QAM | 64QAM | 256QAM | 256QAM |
| Target Coding Rate |  | 0.30 | 0.48 | 0.51 | 0.67 | 0.82 |
| Number of MIMO layers |  | 1 | 1 | 1 | 1 | 1 |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} |  | 18 | 12 | 12 | 12 | 12 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} |  | 18 | 12 | 12 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 2472 | 8456 | 13320 | 23040 | 28680 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | Bits | 3904 | 13064 | 21000 | 36896 | 45096 |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 24 | 24 | 24 | 24 | 24 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | CBs | 1 | 2 | 2 | 3 | 4 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | CBs | 1 | 2 | 3 | 5 | 6 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 10, 11 | Bits | 12480 | 26208 | 39312 | 52416 | TBA |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 8112 | 17472 | 26208 | 34944 | 34944 |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,9,12,…,19} | Bits | 13104 | 27456 | 41184 | 54912 | 54912 |
| Max. Throughput averaged over 2 frames | Mbps | 2.642 | 11.489 | 14.214 | 24.901 | 30.539 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.3.1-2: PDSCH Reference Channel for HD-FDD

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.1-2.1 HD-FDD |  |  |  |  |
| Channel bandwidth | MHz | 10 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Number of allocated resource blocks | PRBs | 52 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} |  | 8 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames | Slots | 15 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 19 |  |  |  |  |
| Modulation |  | 64QAM |  |  |  |  |
| Target Coding Rate |  | 0.51 |  |  |  |  |
| Number of MIMO layers |  | 2 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} |  | 12 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 26632 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | Bits | 42016 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 24 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | CBs | 4 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} | CBs | 5 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For Slots i = 10, 11 | Bits | 78624 |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} | Bits | 52416 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,9,12,…,19} | Bits | 82368 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 28.435 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.3.1-3: PDSCH Reference Channel for HD-FDD PMI reporting requirements

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.1-3.1 HD-FDD |  |  |  |  |
| Channel bandwidth | MHz | 10 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Number of allocated resource blocks | PRBs | 52 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,19} |  | 8 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,2} for i from {1,…,19} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames | Slots | 11 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layer |  | 1 |  |  |  |  |
| Number of DMRS REs (Note 3) |  | 24 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For CSI Slots i, if mod (i,5) =1, i={0,…,19} |  | N/A |  |  |  |  |
| For Non CSI-RS Slot i, if mod (i,5) =3, i={0,..19} | Bits | 7168 |  |  |  |  |
| For Non CSI-RS Slot i, if mod (i,5) ={0,2}, i={1,..19} | Bits | 12040 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For CSI Slots i, if mod (i,5) =1, i={0,…,19} |  | N/A |  |  |  |  |
| For Non CSI-RS Slot i, if mod (i,5) =3, i={0,..19} | Bits | 24 |  |  |  |  |
| For Non CSI-RS Slot i, if mod (i,5) ={0,2}, i={1,..19} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A |  |  |  |  |
| For CSI Slots i, if mod (i,5) =1, i={0,…,19} |  | N/A |  |  |  |  |
| For Non CSI-RS Slot i, if mod (i,5) =3, i={0,..,19} | CBs | 1 |  |  |  |  |
| For Non CSI-RS Slot i, if mod (i,5) ={0,2}, i={1,..,19} | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A |  |  |  |  |
| For CSI Slots i, if mod (i,5) =1, i={0,…,19} |  | N/A |  |  |  |  |
| For Slots i = 10 | Bits | 23712 |  |  |  |  |
| For Non CSI-RS Slot i, if mod (i,5) =3, i={0,..,19} | Bits | 14976 |  |  |  |  |
| For Non CSI-RS Slot i, if mod (i,5) ={0,2}, i={1,..9,11,…,19} | Bits | 24960 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 5.648 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data | | | | | | |

## A.3.2\_1 Reference measurement channels for Sustained downlink data rate performance requirements

### A.3.2\_1.1 FDD

#### A.3.2\_1.1.1 Reference measurement channels for SCS 15 kHz FR1

Table A.3.2\_1.1.1-1: Sustained Downlink Data Rate Reference Channel for FDD 15kHz SCS FR1 (64QAM)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Channel bandwidth** | **Subcarrier spacing** | **Allocated resource blocks** | **Number of consecutive PDSCH symbols for allocated full DL slots (Note 1)** | **MCS Index (Note 2)** | **Modulation** | **Target Coding Rate** | **Number of MIMO layers** | **LDPC Base Graph** | **Information Bit Payload per Slot for allocated full DL slots (Note 1)** | **Transport block CRC per Slot for allocated full DL slots (Note 1)** | **Number of Code Blocks per Slot for allocated full DL slots (Note 1, 6)** | **Binary Channel Bits per Slot for allocated full DL slots (Note 1)** | **Max. Throughput averaged over 2 frames** |
|  | **MHz** | **kHz** | **PRBs** | **Symbols** |  |  |  |  |  | **Bits** | **Bits** | **CBs** | **Bits** | **Mbps** |
|  | 10 | 15 | 52 | 13 | 18 | 64QAM | 0.46 | 1 | 1 | 20496 | 24 | 3 | 44928 | 17.422 |
|  | 20 | 15 | 106 | 13 | 18 | 64QAM | 0.46 | 1 | 1 | 42016 | 24 | 5 | 91584 | 35.714 |
|  | 30 | 15 | 160 | 13 | 18 | 64QAM | 0.46 | 1 | 1 | 62504 | 24 | 8 | 138240 | 53.128 |
|  | 40 | 15 | 216 | 13 | 18 | 64QAM | 0.46 | 1 | 1 | 83976 | 24 | 10 | 186624 | 71.38 |
|  | 10 | 15 | 52 | 13 | 22 | 64QAM | 0.65 | 1 | 1 | 29192 | 24 | 4 | 44928 | 24.813 |
|  | 20 | 15 | 106 | 13 | 22 | 64QAM | 0.65 | 1 | 1 | 59432 | 24 | 8 | 91584 | 50.517 |
|  | 30 | 15 | 160 | 13 | 22 | 64QAM | 0.65 | 1 | 1 | 90176 | 24 | 11 | 138240 | 76.65 |
|  | 40 | 15 | 216 | 13 | 22 | 64QAM | 0.65 | 1 | 1 | 120936 | 24 | 15 | 186624 | 102.796 |
|  | 10 | 15 | 52 | 13 | 23 | 64QAM | 0.7 | 1 | 1 | 31752 | 24 | 4 | 44928 | 26.989 |
|  | 20 | 15 | 106 | 13 | 23 | 64QAM | 0.7 | 1 | 1 | 64552 | 24 | 8 | 91584 | 54.869 |
|  | 30 | 15 | 160 | 13 | 23 | 64QAM | 0.7 | 1 | 1 | 96264 | 24 | 12 | 138240 | 81.824 |
|  | 40 | 15 | 216 | 13 | 23 | 64QAM | 0.7 | 1 | 1 | 131176 | 24 | 16 | 186624 | 111.5 |
|  | 10 | 15 | 52 | 13 | 27 | 64QAM | 0.89 | 1 | 1 | 39936 | 24 | 5 | 44928 | 33.946 |
|  | 20 | 15 | 106 | 13 | 27 | 64QAM | 0.89 | 1 | 1 | 81976 | 24 | 10 | 91584 | 69.68 |
|  | 30 | 15 | 160 | 13 | 27 | 64QAM | 0.89 | 1 | 1 | 122976 | 24 | 15 | 138240 | 104.53 |
|  | 40 | 15 | 216 | 13 | 27 | 64QAM | 0.89 | 1 | 1 | 163976 | 24 | 20 | 186624 | 139.38 |
|  | 10 | 15 | 52 | 13 | 18 | 64QAM | 0.46 | 2 | 1 | 40976 | 24 | 5 | 89856 | 34.83 |
|  | 20 | 15 | 106 | 13 | 18 | 64QAM | 0.46 | 2 | 1 | 83976 | 24 | 10 | 183168 | 71.38 |
|  | 30 | 15 | 160 | 13 | 18 | 64QAM | 0.46 | 2 | 1 | 125016 | 24 | 15 | 276480 | 106.264 |
|  | 40 | 15 | 216 | 13 | 18 | 64QAM | 0.46 | 2 | 1 | 167976 | 24 | 20 | 373248 | 142.78 |
|  | 10 | 15 | 52 | 13 | 22 | 64QAM | 0.65 | 2 | 1 | 58384 | 24 | 7 | 89856 | 49.626 |
|  | 20 | 15 | 106 | 13 | 22 | 64QAM | 0.65 | 2 | 1 | 118896 | 24 | 15 | 183168 | 101.062 |
|  | 30 | 15 | 160 | 13 | 22 | 64QAM | 0.65 | 2 | 1 | 180376 | 24 | 22 | 276480 | 153.32 |
|  | 40 | 15 | 216 | 13 | 22 | 64QAM | 0.65 | 2 | 1 | 241720 | 24 | 29 | 373248 | 205.462 |
|  | 10 | 15 | 52 | 13 | 23 | 64QAM | 0.7 | 2 | 1 | 63528 | 24 | 8 | 89856 | 53.999 |
|  | 20 | 15 | 106 | 13 | 23 | 64QAM | 0.7 | 2 | 1 | 129128 | 24 | 16 | 183168 | 109.759 |
|  | 30 | 15 | 160 | 13 | 23 | 64QAM | 0.7 | 2 | 1 | 192624 | 24 | 23 | 276480 | 163.73 |
|  | 40 | 15 | 216 | 13 | 23 | 64QAM | 0.7 | 2 | 1 | 262376 | 24 | 32 | 373248 | 223.02 |
|  | 10 | 15 | 52 | 13 | 27 | 64QAM | 0.89 | 2 | 1 | 79896 | 24 | 10 | 89856 | 67.912 |
|  | 20 | 15 | 106 | 13 | 27 | 64QAM | 0.89 | 2 | 1 | 163976 | 24 | 20 | 183168 | 139.38 |
|  | 30 | 15 | 160 | 13 | 27 | 64QAM | 0.89 | 2 | 1 | 245976 | 24 | 30 | 276480 | 209.08 |
|  | 40 | 15 | 216 | 13 | 27 | 64QAM | 0.89 | 2 | 1 | 327888 | 24 | 39 | 373248 | 278.705 |
|  | 10 | 15 | 52 | 13 | 19 | 64QAM | 0.5 | 4 | 1 | 83976 | 24 | 10 | 164736 | 71.38 |
|  | 20 | 15 | 106 | 13 | 19 | 64QAM | 0.5 | 4 | 1 | 167976 | 24 | 20 | 335808 | 142.78 |
|  | 30 | 15 | 160 | 13 | 19 | 64QAM | 0.5 | 4 | 1 | 254176 | 24 | 31 | 506880 | 216.05 |
|  | 40 | 15 | 216 | 13 | 19 | 64QAM | 0.5 | 4 | 1 | 344376 | 24 | 41 | 684288 | 292.72 |
|  | 10 | 15 | 52 | 13 | 23 | 64QAM | 0.7 | 4 | 1 | 114776 | 24 | 14 | 164736 | 97.56 |
|  | 20 | 15 | 106 | 13 | 23 | 64QAM | 0.7 | 4 | 1 | 237776 | 24 | 29 | 335808 | 202.11 |
|  | 30 | 15 | 160 | 13 | 23 | 64QAM | 0.7 | 4 | 1 | 352440 | 24 | 42 | 506880 | 299.574 |
|  | 40 | 15 | 216 | 13 | 23 | 64QAM | 0.7 | 4 | 1 | 483464 | 24 | 58 | 684288 | 410.944 |
|  | 10 | 15 | 52 | 13 | 24 | 64QAM | 0.75 | 4 | 1 | 125016 | 24 | 15 | 164736 | 106.264 |
|  | 20 | 15 | 106 | 13 | 24 | 64QAM | 0.75 | 4 | 1 | 254176 | 24 | 31 | 335808 | 216.05 |
|  | 30 | 15 | 160 | 13 | 24 | 64QAM | 0.75 | 4 | 1 | 385272 | 24 | 46 | 506880 | 327.481 |
|  | 40 | 15 | 216 | 13 | 24 | 64QAM | 0.75 | 4 | 1 | 516312 | 24 | 62 | 684288 | 438.865 |
|  | 10 | 15 | 52 | 13 | 27 | 64QAM | 0.89 | 4 | 1 | 147576 | 24 | 18 | 164736 | 125.44 |
|  | 20 | 15 | 106 | 13 | 27 | 64QAM | 0.89 | 4 | 1 | 295176 | 24 | 36 | 335808 | 250.9 |
|  | 30 | 15 | 160 | 13 | 27 | 64QAM | 0.89 | 4 | 1 | 450984 | 24 | 54 | 506880 | 383.336 |
|  | 40 | 15 | 216 | 13 | 27 | 64QAM | 0.89 | 4 | 1 | 606504 | 24 | 72 | 684288 | 515.528 |
| Note 1: Allocated full DL slots are with slot index i, if i is not in {0,10,11} for i = 0,1,...,19. So total number of allocated slots per 2 frames is 17.  Note 2: MCS Index is based on MCS Table defined in TS38.214 when 256QAM is not enabled. MCS 18 and 19 are equivalent to MCS 11 and 12 in 256QAM table, respectively.  Note 3: Number of DMRS REs per RB = 12,12,24,24 for number of MIMO layers = 1,2,3,4, respectively  Note 4: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 5: Overhead parameter for TBS determination is 0.  Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | | |

Table A.3.2\_1.1.1-2: Sustained Downlink Data Rate Reference Channel for FDD 15kHz SCS FR1 (256QAM)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Channel bandwidth** | **Subcarrier spacing** | **Allocated resource blocks** | **Number of consecutive PDSCH symbols for allocated full DL slots (Note 1)** | **MCS Index (Note 2)** | **Modulation** | **Target Coding Rate** | **Number of MIMO layers** | **LDPC Base Graph** | **Information Bit Payload per Slot for allocated full DL slots (Note 1)** | **Transport block CRC per Slot for allocated full DL slots (Note 1)** | **Number of Code Blocks per Slot for allocated full DL slots (Note 1, 6)** | **Binary Channel Bits per Slot for allocated full DL slots (Note 1)** | **Max. Throughput averaged over 2 frames** |
|  | **MHz** | **kHz** | **PRBs** | **Symbols** |  |  |  |  |  | **Bits** | **Bits** | **CBs** | **Bits** | **Mbps** |
|  | 10 | 15 | 52 | 13 | 20 | 256QAM | 0.67 | 1 | 1 | 39936 | 24 | 5 | 59904 | 33.946 |
|  | 20 | 15 | 106 | 13 | 20 | 256QAM | 0.67 | 1 | 1 | 81976 | 24 | 10 | 122112 | 69.68 |
|  | 30 | 15 | 160 | 13 | 20 | 256QAM | 0.67 | 1 | 1 | 122976 | 24 | 15 | 184320 | 104.53 |
|  | 40 | 15 | 216 | 13 | 20 | 256QAM | 0.67 | 1 | 1 | 163976 | 24 | 20 | 248832 | 139.38 |
|  | 10 | 15 | 52 | 13 | 21 | 256QAM | 0.69 | 1 | 1 | 42016 | 24 | 5 | 59904 | 35.714 |
|  | 20 | 15 | 106 | 13 | 21 | 256QAM | 0.69 | 1 | 1 | 83976 | 24 | 10 | 122112 | 71.38 |
|  | 30 | 15 | 160 | 13 | 20 | 256QAM | 0.67 | 1 | 1 | 122976 | 24 | 15 | 184320 | 104.53 |
|  | 40 | 15 | 216 | 13 | 20 | 256QAM | 0.67 | 1 | 1 | 163976 | 24 | 20 | 248832 | 139.38 |
|  | 10 | 15 | 52 | 13 | 26 | 256QAM | 0.9 | 1 | 1 | 53288 | 24 | 7 | 59904 | 45.295 |
|  | 20 | 15 | 106 | 13 | 26 | 256QAM | 0.9 | 1 | 1 | 108552 | 24 | 13 | 122112 | 92.269 |
|  | 30 | 15 | 160 | 13 | 26 | 256QAM | 0.9 | 1 | 1 | 163976 | 24 | 20 | 184320 | 139.38 |
|  | 40 | 15 | 216 | 13 | 26 | 256QAM | 0.9 | 1 | 1 | 221376 | 24 | 27 | 248832 | 188.17 |
|  | 10 | 15 | 52 | 13 | 20 | 256QAM | 0.67 | 2 | 1 | 79896 | 24 | 10 | 119808 | 67.912 |
|  | 20 | 15 | 106 | 13 | 20 | 256QAM | 0.67 | 2 | 1 | 163976 | 24 | 20 | 244224 | 139.38 |
|  | 30 | 15 | 160 | 13 | 20 | 256QAM | 0.67 | 2 | 1 | 245976 | 24 | 30 | 368640 | 209.08 |
|  | 40 | 15 | 216 | 13 | 20 | 256QAM | 0.67 | 2 | 1 | 327888 | 24 | 39 | 497664 | 278.705 |
|  | 10 | 15 | 52 | 13 | 21 | 256QAM | 0.69 | 2 | 1 | 83976 | 24 | 10 | 119808 | 71.38 |
|  | 20 | 15 | 106 | 13 | 21 | 256QAM | 0.69 | 2 | 1 | 167976 | 24 | 20 | 244224 | 142.78 |
|  | 25 | 15 | 133 | 13 | 21 | 256QAM | 0.69 | 2 | 1 | 213176 | 24 | 26 | 306432 | 181.2 |
|  | 30 | 15 | 160 | 13 | 21 | 256QAM | 0.69 | 2 | 1 | 254176 | 24 | 31 | 368640 | 216.05 |
|  | 40 | 15 | 216 | 13 | 21 | 256QAM | 0.69 | 2 | 1 | 344376 | 24 | 41 | 497664 | 292.72 |
|  | 10 | 15 | 52 | 13 | 26 | 256QAM | 0.9 | 2 | 1 | 106576 | 24 | 13 | 119808 | 90.59 |
|  | 20 | 15 | 106 | 13 | 26 | 256QAM | 0.9 | 2 | 1 | 217128 | 24 | 26 | 244224 | 184.559 |
|  | 30 | 15 | 160 | 13 | 26 | 256QAM | 0.9 | 2 | 1 | 327888 | 24 | 39 | 368640 | 278.705 |
|  | 40 | 15 | 216 | 13 | 26 | 256QAM | 0.9 | 2 | 1 | 442632 | 24 | 53 | 497664 | 376.237 |
|  | 10 | 15 | 52 | 13 | 22 | 256QAM | 0.74 | 4 | 1 | 159880 | 24 | 19 | 219648 | 135.898 |
|  | 20 | 15 | 106 | 13 | 22 | 256QAM | 0.74 | 4 | 1 | 327888 | 24 | 39 | 447744 | 278.705 |
|  | 30 | 15 | 160 | 13 | 22 | 256QAM | 0.74 | 4 | 1 | 500136 | 24 | 60 | 675840 | 425.116 |
|  | 40 | 15 | 216 | 13 | 22 | 256QAM | 0.74 | 4 | 1 | 671976 | 24 | 80 | 912384 | 571.18 |
|  | 10 | 15 | 52 | 13 | 23 | 256QAM | 0.78 | 4 | 1 | 172176 | 24 | 21 | 219648 | 146.35 |
|  | 20 | 15 | 106 | 13 | 23 | 256QAM | 0.78 | 4 | 1 | 352440 | 24 | 42 | 447744 | 299.574 |
|  | 25 | 15 | 133 | 13 | 23 | 256QAM | 0.78 | 4 | 1 | 434280 | 24 | 52 | 561792 | 369.138 |
|  | 30 | 15 | 160 | 13 | 23 | 256QAM | 0.78 | 4 | 1 | 524640 | 24 | 63 | 675840 | 445.944 |
|  | 40 | 15 | 216 | 13 | 23 | 256QAM | 0.78 | 4 | 1 | 704904 | 24 | 84 | 912384 | 599.168 |
|  | 10 | 15 | 52 | 13 | 26 | 256QAM | 0.9 | 4 | 1 | 196776 | 24 | 24 | 219648 | 167.26 |
|  | 20 | 15 | 106 | 13 | 26 | 256QAM | 0.9 | 4 | 1 | 401640 | 24 | 48 | 447744 | 341.394 |
|  | 30 | 15 | 160 | 13 | 26 | 256QAM | 0.9 | 4 | 1 | 606504 | 24 | 72 | 675840 | 515.528 |
|  | 40 | 15 | 216 | 13 | 26 | 256QAM | 0.9 | 4 | 1 | 819256 | 24 | 98 | 912384 | 696.368 |
| Note 1: Allocated full DL slots are with slot index i, if i is not in {0,10,11} for i = 0,1,...,19. So total number of allocated slots per 2 frames is 17.  Note 2: MCS Index is based on MCS Table defined in TS38.214 when 256QAM is enabled.  Note 3: Number of DMRS REs per RB = 12,12,24,24 for number of MIMO layers = 1,2,3,4, respectively  Note 4: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 5: Overhead parameter for TBS determination is 0.  Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | | |

Table A.3.2\_1.1.1-3: Sustained Downlink Data Rate Reference Channel for FDD 15kHz SCS FR1 (1024QAM)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Channel bandwidth** | **Subcarrier spacing** | **Allocated resource blocks** | **Number of consecutive PDSCH symbols for allocated full DL slots (Note 1)** | **MCS Index (Note 2)** | **Modulation** | **Target Coding Rate** | **Number of MIMO layers** | **LDPC Base Graph** | **Information Bit Payload per Slot for allocated full DL slots (Note 1)** | **Transport block CRC per Slot for allocated full DL slots (Note 1)** | **Number of Code Blocks per Slot for allocated full DL slots (Note 1, 6)** | **Binary Channel Bits per Slot for allocated full DL slots (Note 1)** | **Max. Throughput averaged over 2 frames** |
|  | **MHz** | **kHz** | **PRBs** | **Symbols** |  |  |  |  |  | **Bits** | **Bits** | **CBs** | **Bits** | **Mbps** |
|  | 10 | 15 | 52 | 13 | 23 | 1024QAM | 0.79 | 1 | 1 | 58384 | 24 | 7 | 74880 | 49.626 |
|  | 20 | 15 | 106 | 13 | 23 | 1024QAM | 0.79 | 1 | 1 | 120936 | 24 | 15 | 152640 | 102.796 |
|  | 30 | 15 | 160 | 13 | 23 | 1024QAM | 0.79 | 1 | 1 | 180376 | 24 | 22 | 230400 | 153.32 |
|  | 40 | 15 | 216 | 13 | 23 | 1024QAM | 0.79 | 1 | 1 | 245976 | 24 | 30 | 311040 | 209.08 |
|  | 10 | 15 | 52 | 13 | 24 | 1024QAM | 0.83 | 1 | 1 | 62504 | 24 | 8 | 74880 | 53.128 |
|  | 20 | 15 | 106 | 13 | 24 | 1024QAM | 0.83 | 1 | 1 | 127080 | 24 | 16 | 152640 | 108.018 |
|  | 30 | 15 | 160 | 13 | 24 | 1024QAM | 0.83 | 1 | 1 | 192624 | 24 | 23 | 230400 | 163.73 |
|  | 40 | 15 | 216 | 13 | 24 | 1024QAM | 0.83 | 1 | 1 | 258144 | 24 | 31 | 311040 | 219.422 |
|  | 10 | 15 | 52 | 13 | 23 | 1024QAM | 0.79 | 2 | 1 | 118896 | 24 | 15 | 149760 | 101.062 |
|  | 20 | 15 | 106 | 13 | 23 | 1024QAM | 0.79 | 2 | 1 | 241720 | 24 | 29 | 305280 | 205.462 |
|  | 30 | 15 | 160 | 13 | 23 | 1024QAM | 0.79 | 2 | 1 | 360488 | 24 | 43 | 460800 | 306.415 |
|  | 40 | 15 | 216 | 13 | 23 | 1024QAM | 0.79 | 2 | 1 | 491800 | 24 | 59 | 622080 | 418.03 |
| Note 1: Allocated full DL slots are with slot index i, if i is not in {0,10,11} for i = 0,1,...,19. So total number of allocated slots per 2 frames is 17.  Note 2: MCS Index is based on MCS Table defined in TS38.214 when 1024QAM is enabled.  Note 3: Number of DMRS REs per RB = 12,12,24,24 for number of MIMO layers = 1,2,3,4, respectively  Note 4: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 5: Overhead parameter for TBS determination is 0.  Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | | |

### A.3.2\_1.2 TDD

#### A.3.2\_1.2.1 Reference measurement channels for SCS 30 kHz FR1

Table A.3.2\_1.2.1-1: Sustained Downlink Data Rate Reference Channel for TDD 30kHz SCS FR1 (64QAM)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Channel bandwidth** | **Subcarrier spacing** | **Allocated resource blocks** | **Number of consecutive PDSCH symbols for allocated full DL slots (Note 1)** | **MCS Index (Note 2)** | **Modulation** | **Target Coding Rate** | **Number of MIMO layers** | **LDPC Base Graph** | **Information Bit Payload per Slot for allocated full DL slots (Note 1)** | **Transport block CRC per Slot for allocated full DL slots (Note 1)** | **Number of Code Blocks per Slot for allocated full DL slots (Note 1, 6)** | **Binary Channel Bits per Slot for allocated full DL slots (Note 1)** | **Max. Throughput averaged over 2 frames** |
|  | **MHz** | **kHz** | **PRBs** | **Symbols** |  |  |  |  |  | **Bits** | **Bits** | **CBs** | **Bits** | **Mbps** |
|  | 20 | 30 | 51 | 13 | 18 | 64QAM | 0.46 | 1 | 1 | 19968 | 24 | 3 | 44064 | 24.96 |
|  | 100 | 30 | 273 | 13 | 18 | 64QAM | 0.46 | 1 | 1 | 106576 | 24 | 13 | 235872 | 133.22 |
|  | 20 | 30 | 51 | 13 | 22 | 64QAM | 0.65 | 1 | 1 | 28680 | 24 | 4 | 44064 | 35.85 |
|  | 100 | 30 | 273 | 13 | 22 | 64QAM | 0.65 | 1 | 1 | 151608 | 24 | 18 | 235872 | 189.51 |
|  | 20 | 30 | 51 | 13 | 23 | 64QAM | 0.7 | 1 | 1 | 30728 | 24 | 4 | 44064 | 38.41 |
|  | 100 | 30 | 273 | 13 | 23 | 64QAM | 0.7 | 1 | 1 | 163976 | 24 | 20 | 235872 | 204.97 |
|  | 20 | 30 | 51 | 13 | 27 | 64QAM | 0.89 | 1 | 1 | 38936 | 24 | 5 | 44064 | 48.67 |
|  | 100 | 30 | 273 | 13 | 27 | 64QAM | 0.89 | 1 | 1 | 208976 | 24 | 25 | 235872 | 261.22 |
|  | 20 | 30 | 51 | 13 | 18 | 64QAM | 0.46 | 2 | 1 | 39936 | 24 | 5 | 88128 | 49.92 |
|  | 100 | 30 | 273 | 13 | 18 | 64QAM | 0.46 | 2 | 1 | 213176 | 24 | 26 | 471744 | 266.47 |
|  | 20 | 30 | 51 | 13 | 22 | 64QAM | 0.65 | 2 | 1 | 57376 | 24 | 7 | 88128 | 71.72 |
|  | 100 | 30 | 273 | 13 | 22 | 64QAM | 0.65 | 2 | 1 | 303240 | 24 | 36 | 471744 | 379.05 |
|  | 20 | 30 | 51 | 13 | 23 | 64QAM | 0.7 | 2 | 1 | 61480 | 24 | 8 | 88128 | 76.85 |
|  | 100 | 30 | 273 | 13 | 23 | 64QAM | 0.7 | 2 | 1 | 327888 | 24 | 39 | 471744 | 409.86 |
|  | 20 | 30 | 51 | 13 | 27 | 64QAM | 0.89 | 2 | 1 | 77896 | 24 | 10 | 88128 | 97.37 |
|  | 100 | 30 | 273 | 13 | 27 | 64QAM | 0.89 | 2 | 1 | 417976 | 24 | 50 | 471744 | 522.47 |
|  | 20 | 30 | 51 | 13 | 19 | 64QAM | 0.5 | 4 | 1 | 81976 | 24 | 10 | 161568 | 102.47 |
|  | 100 | 30 | 273 | 13 | 19 | 64QAM | 0.5 | 4 | 1 | 434280 | 24 | 52 | 864864 | 542.85 |
|  | 20 | 30 | 51 | 13 | 23 | 64QAM | 0.7 | 4 | 1 | 112648 | 24 | 14 | 161568 | 140.81 |
|  | 100 | 30 | 273 | 13 | 23 | 64QAM | 0.7 | 4 | 1 | 606504 | 24 | 72 | 864864 | 758.13 |
|  | 20 | 30 | 51 | 13 | 24 | 64QAM | 0.75 | 4 | 1 | 120936 | 24 | 15 | 161568 | 151.17 |
|  | 100 | 30 | 273 | 13 | 24 | 64QAM | 0.75 | 4 | 1 | 655800 | 24 | 78 | 864864 | 819.75 |
|  | 20 | 30 | 51 | 13 | 27 | 64QAM | 0.89 | 4 | 1 | 143400 | 24 | 18 | 161568 | 179.25 |
|  | 100 | 30 | 273 | 13 | 27 | 64QAM | 0.89 | 4 | 1 | 770568 | 24 | 92 | 864864 | 963.21 |
| Note 1: Allocated full DL slots are with slot index i, if mod(i,10) = 0,1,2,3,4,5,6 and i is not in {0,20,21} for i = 0,1,...,39. So total number of allocated slots per 2 frames is 25.  Note 2: MCS Index is based on MCS Table defined in TS38.214 when 256QAM is not enabled. MCS 18 and 19 are equivalent to MCS 11 and 12 in 256QAM table, respectively.  Note 3: Number of DMRS REs per RB = 12,12,24,24 for number of MIMO layers = 1,2,3,4, respectively  Note 4: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 5: Overhead parameter for TBS determination is 0.  Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | | |

Table A.3.2\_1.2.1-2: Sustained Downlink Data Rate Reference Channel for TDD 30kHz SCS FR1(256QAM)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Channel bandwidth** | **Subcarrier spacing** | **Allocated resource blocks** | **Number of consecutive PDSCH symbols for allocated full DL slots (Note 1)** | **MCS Index (Note 2)** | **Modulation** | **Target Coding Rate** | **Number of MIMO layers** | **LDPC Base Graph** | **Information Bit Payload per Slot for allocated full DL slots (Note 1)** | **Transport block CRC per Slot for allocated full DL slots (Note 1)** | **Number of Code Blocks per Slot for allocated full DL slots (Note 1, 6)** | **Binary Channel Bits per Slot for allocated full DL slots (Note 1)** | **Max. Throughput averaged over 2 frames** |
|  | **MHz** | **kHz** | **PRBs** | **Symbols** |  |  |  |  |  | **Bits** | **Bits** | **CBs** | **Bits** | **Mbps** |
|  | 20 | 30 | 51 | 13 | 20 | 256QAM | 0.67 | 1 | 1 | 38936 | 24 | 5 | 58752 | 48.67 |
|  | 100 | 30 | 273 | 13 | 20 | 256QAM | 0.67 | 1 | 1 | 208976 | 24 | 25 | 314496 | 261.22 |
|  | 20 | 30 | 51 | 13 | 21 | 256QAM | 0.69 | 1 | 1 | 40976 | 24 | 5 | 58752 | 51.22 |
|  | 100 | 30 | 273 | 13 | 21 | 256QAM | 0.69 | 1 | 1 | 217128 | 24 | 26 | 314496 | 271.41 |
|  | 20 | 30 | 51 | 13 | 26 | 256QAM | 0.9 | 1 | 1 | 52224 | 24 | 7 | 58752 | 65.28 |
|  | 100 | 30 | 273 | 13 | 26 | 256QAM | 0.9 | 1 | 1 | 278776 | 24 | 34 | 314496 | 348.47 |
|  | 20 | 30 | 51 | 13 | 20 | 256QAM | 0.67 | 2 | 1 | 77896 | 24 | 10 | 117504 | 97.37 |
|  | 100 | 30 | 273 | 13 | 20 | 256QAM | 0.67 | 2 | 1 | 417976 | 24 | 50 | 628992 | 522.47 |
|  | 20 | 30 | 51 | 13 | 21 | 256QAM | 0.69 | 2 | 1 | 81976 | 24 | 10 | 117504 | 102.47 |
|  | 100 | 30 | 273 | 13 | 21 | 256QAM | 0.69 | 2 | 1 | 434280 | 24 | 52 | 628992 | 542.85 |
|  | 20 | 30 | 51 | 13 | 26 | 256QAM | 0.9 | 2 | 1 | 104496 | 24 | 13 | 117504 | 130.62 |
|  | 100 | 30 | 273 | 13 | 26 | 256QAM | 0.9 | 2 | 1 | 557416 | 24 | 67 | 628992 | 696.77 |
|  | 20 | 30 | 51 | 13 | 22 | 256QAM | 0.74 | 4 | 1 | 159880 | 24 | 19 | 215424 | 199.85 |
|  | 100 | 30 | 273 | 13 | 22 | 256QAM | 0.74 | 4 | 1 | 852696 | 24 | 102 | 1153152 | 1065.87 |
|  | 20 | 30 | 51 | 13 | 23 | 256QAM | 0.78 | 4 | 1 | 167976 | 24 | 20 | 215424 | 209.97 |
|  | 100 | 30 | 273 | 13 | 23 | 256QAM | 0.78 | 4 | 1 | 901344 | 24 | 107 | 1153152 | 1126.68 |
|  | 20 | 30 | 51 | 13 | 26 | 256QAM | 0.9 | 4 | 1 | 192624 | 24 | 23 | 215424 | 240.78 |
|  | 100 | 30 | 273 | 13 | 26 | 256QAM | 0.9 | 4 | 1 | 1032192 | 24 | 123 | 1153152 | 1290.24 |
| Note 1: Allocated full DL slots are with slot index i, if mod(i,10) = 0,1,2,3,4,5,6 and i is not in {0,20,21} for i = 0,1,...,39. So total number of allocated slots per 2 frames is 25.  Note 2: MCS Index is based on MCS Table defined in TS38.214 when 256QAM is enabled.  Note 3: Number of DMRS REs per RB = 12,12,24,24 for number of MIMO layers = 1,2,3,4, respectively  Note 4: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 5: Overhead parameter for TBS determination is 0.  Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | | |

Table A.3.2\_1.2.1-3: Sustained Downlink Data Rate Reference Channel for TDD 30kHz SCS FR1(1024QAM)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Channel bandwidth** | **Subcarrier spacing** | **Allocated resource blocks** | **Number of consecutive PDSCH symbols for allocated full DL slots (Note 1)** | **MCS Index (Note 2)** | **Modulation** | **Target Coding Rate** | **Number of MIMO layers** | **LDPC Base Graph** | **Information Bit Payload per Slot for allocated full DL slots (Note 1)** | **Transport block CRC per Slot for allocated full DL slots (Note 1)** | **Number of Code Blocks per Slot for allocated full DL slots (Note 1, 6)** | **Binary Channel Bits per Slot for allocated full DL slots (Note 1)** | **Max. Throughput averaged over 2 frames** |
|  | **MHz** | **kHz** | **PRBs** | **Symbols** |  |  |  |  |  | **Bits** | **Bits** | **CBs** | **Bits** | **Mbps** |
|  | 20 | 30 | 51 | 13 | 23 | 1024QAM | 0.79 | 1 | 1 | 57376 | 24 | 7 | 73440 | 71.72 |
|  | 100 | 30 | 273 | 13 | 23 | 1024QAM | 0.79 | 1 | 1 | 311368 | 24 | 37 | 393120 | 389.21 |
|  | 20 | 30 | 51 | 13 | 24 | 1024QAM | 0.83 | 1 | 1 | 61480 | 24 | 8 | 73440 | 76.85 |
|  | 100 | 30 | 273 | 13 | 24 | 1024QAM | 0.83 | 1 | 1 | 327888 | 24 | 39 | 393120 | 409.86 |
|  | 20 | 30 | 51 | 13 | 23 | 1024QAM | 0.79 | 2 | 1 | 114776 | 24 | 14 | 146880 | 143.47 |
|  | 100 | 30 | 273 | 13 | 23 | 1024QAM | 0.79 | 2 | 1 | 622760 | 24 | 74 | 786240 | 778.45 |
| Note 1: Allocated full DL slots are with slot index i, if mod(i,10) = 0,1,2,3,4,5,6 and i is not in {0,20,21} for i = 0,1,...,39. So total number of allocated slots per 2 frames is 25.  Note 2: MCS Index is based on MCS Table defined in TS38.214 when 1024QAM is enabled.  Note 3: Number of DMRS REs per RB = 12,12,24,24 for number of MIMO layers = 1,2,3,4, respectively  Note 4: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 5: Overhead parameter for TBS determination is 0.  Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | | |

#### A.3.2\_1.2.2 Reference measurement channels for SCS 120 kHz FR2

Table A.3.2\_1.2.2-1: Sustained Downlink Data Rate Reference Channel for TDD 120kHz SCS FR2 (QPSK)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier spacing | Allocated resource blocks | Number of consecutive PDSCH symbols for allocated full DL slots (Note 1) | MCS Index (Note 2) | Modulation | Target Coding Rate | Number of MIMO layers | LDPC Base Graph | Information Bit Payload per Slot for allocated full DL slots (Note 1) | Transport block CRC per Slot for allocated full DL slots (Note 1) | Number of Code Blocks per Slot for allocated full DL slots (Note 1, 6) | Binary Channel Bits per Slot for allocated full DL slots (Note 1) | Max. Throughput averaged over 2 frames |
|  | MHz | kHz | PRBs | Symbols |  |  |  |  |  | Bits | Bits | CBs | Bits | Mbps |
|  | 50 | 120 | 32 | 13 | 9 | QPSK | 0.66 | 1 | 1 | 5888 | 24 | 1 | 8800 | 27.379 |
|  | 100 | 120 | 66 | 13 | 9 | QPSK | 0.66 | 1 | 1 | 12040 | 24 | 2 | 18150 | 55.986 |
|  | 200 | 120 | 132 | 13 | 9 | QPSK | 0.66 | 1 | 1 | 24072 | 24 | 3 | 36300 | 111.935 |
|  | 50 | 120 | 32 | 13 | 9 | QPSK | 0.66 | 2 | 1 | 11784 | 24 | 2 | 17600 | 54.796 |
|  | 100 | 120 | 66 | 13 | 9 | QPSK | 0.66 | 2 | 1 | 24072 | 24 | 3 | 36300 | 111.935 |
|  | 200 | 120 | 132 | 13 | 9 | QPSK | 0.66 | 2 | 1 | 48168 | 24 | 6 | 72600 | 223.981 |
| Note 1: Allocated full DL slots are with slot index i, if mod(i,5) = 0,1,2 and i is not in {0,80,81} for i = 0,1,...,159. So total number of allocated slots per 2 frames is 93.  Note 2: MCS Index is based on MCS Table defined in TS38.214 when 256QAM is not enabled.  Note 3: Number of DMRS REs per RB is 12.  Note 4: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 5: Overhead parameter for TBS determination is 6.  Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | | |

Table A.3.2\_1.2.2-2: Sustained Downlink Data Rate Reference Channel for TDD 120kHz SCS FR2 (16QAM)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Channel bandwidth** | **Subcarrier spacing** | **Allocated resource blocks** | **Number of consecutive PDSCH symbols for allocated full DL slots (Note 1)** | **MCS Index (Note 2)** | **Modulation** | **Target Coding Rate** | **Number of MIMO layers** | **LDPC Base Graph** | **Information Bit Payload per Slot for allocated full DL slots (Note 1)** | **Transport block CRC per Slot for allocated full DL slots (Note 1)** | **Number of Code Blocks per Slot for allocated full DL slots (Note 1, 6)** | **Binary Channel Bits per Slot for allocated full DL slots (Note 1)** | **Max. Throughput averaged over 2 frames** |
|  | **MHz** | **kHz** | **PRBs** | **Symbols** |  |  |  |  |  | **Bits** | **Bits** | **CBs** | **Bits** | **Mbps** |
|  | 50 | 120 | 32 | 13 | 16 | 16QAM | 0.64 | 1 | 1 | 11272 | 24 | 2 | 17600 | 52.415 |
|  | 100 | 120 | 66 | 13 | 16 | 16QAM | 0.64 | 1 | 1 | 23568 | 24 | 3 | 36300 | 109.591 |
|  | 200 | 120 | 132 | 13 | 16 | 16QAM | 0.64 | 1 | 1 | 47112 | 24 | 6 | 72600 | 219.071 |
|  | 50 | 120 | 32 | 13 | 16 | 16QAM | 0.64 | 2 | 1 | 22536 | 24 | 3 | 35200 | 104.792 |
|  | 100 | 120 | 66 | 13 | 16 | 16QAM | 0.64 | 2 | 1 | 47112 | 24 | 6 | 72600 | 219.071 |
|  | 200 | 120 | 132 | 13 | 16 | 16QAM | 0.64 | 2 | 1 | 94248 | 24 | 12 | 145200 | 438.253 |
| Note 1: Allocated full DL slots are with slot index i, if mod(i,5) = 0,1,2 and i is not in {0,80,81} for i = 0,1,...,159. So total number of allocated slots per 2 frames is 93.  Note 2: MCS Index is based on MCS Table defined in TS38.214 when 256QAM is not enabled.  Note 3: Number of DMRS REs per RB is 12.  Note 4: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 5: Overhead parameter for TBS determination is 6.  Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | |  |

Table A.3.2\_1.2.2-3: Sustained Downlink Data Rate Reference Channel for TDD 120kHz SCS FR2 (64QAM)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Channel bandwidth** | **Subcarrier spacing** | **Allocated resource blocks** | **Number of consecutive PDSCH symbols for allocated full DL slots (Note 1)** | **MCS Index (Note 2)** | **Modulation** | **Target Coding Rate** | **Number of MIMO layers** | **LDPC Base Graph** | **Information Bit Payload per Slot for allocated full DL slots (Note 1)** | **Transport block CRC per Slot for allocated full DL slots (Note 1)** | **Number of Code Blocks per Slot for allocated full DL slots (Note 1, 6)** | **Binary Channel Bits per Slot for allocated full DL slots (Note 1)** | **Max. Throughput averaged over 2 frames** |
|  | **MHz** | **KHz** | **PRBs** | **Symbols** |  |  |  |  |  | **Bits** | **Bits** | **CBs** | **Bits** | **Mbps** |
|  | 50 | 120 | 32 | 13 | 27 | 64QAM | 0.89 | 1 | 1 | 23568 | 24 | 3 | 26400 | 109.591 |
|  | 100 | 120 | 66 | 13 | 27 | 64QAM | 0.89 | 1 | 1 | 48168 | 24 | 6 | 54450 | 223.981 |
|  | 200 | 120 | 132 | 13 | 27 | 64QAM | 0.89 | 1 | 1 | 96264 | 24 | 12 | 108900 | 447.628 |
|  | 50 | 120 | 32 | 13 | 27 | 64QAM | 0.89 | 2 | 1 | 47112 | 24 | 6 | 52800 | 219.071 |
|  | 100 | 120 | 66 | 13 | 27 | 64QAM | 0.89 | 2 | 1 | 96264 | 24 | 12 | 108900 | 447.628 |
|  | 200 | 120 | 132 | 13 | 27 | 64QAM | 0.89 | 2 | 1 | 192624 | 24 | 23 | 217800 | 895.702 |
| Note 1: Allocated full DL slots are with slot index i, if mod(i,5) = 0,1,2 and i is not in {0,80,81} for i = 0,1,...,159. So total number of allocated slots per 2 frames is 93.  Note 2: MCS Index is based on MCS Table defined in TS38.214 when 256QAM is not enabled.  Note 3: Number of DMRS REs per RB is 12.  Note 4: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 5: Overhead parameter for TBS determination is 6.  Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | | |  |

## A.3.3 Reference measurement channels for PDCCH performance requirements

### A.3.3.1 FDD

#### A.3.3.1.1 Reference measurement channels for SCS 15 kHz FR1

Table A.3.3.1.1-1: PDCCH Reference Channels (Time domain allocation 1 symbol)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.PDCCH.1-1.1 FDD | R.PDCCH.1-1.2 FDD | R.PDCCH.1-1.3 FDD |  |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 |  |  |  |
| CORESET frequency domain allocation |  | 48 | 48 | 48 |  |  |  |
| CORESET time domain allocation |  | 1 | 1 | 1 |  |  |  |
| Aggregation level |  | 4 | 4 | 8 |  |  |  |
| DCI Format |  | 1\_0 | 1\_1 | 1\_1 |  |  |  |
| Payload (without CRC) | Bits | 39 | 52 | 52 |  |  |  |

Table A.3.3.1.1-2: PDCCH Reference Channel (Time domain allocation 2 symbols)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | | | |
| Reference channel |  | R.PDCCH.1-2.1 FDD | R.PDCCH.1-2.2 FDD | R.PDCCH.1-2.3 FDD | R.PDCCH.1-2.4 FDD | R.PDCCH.1-2.5 FDD | R.PDCCH.1-2.6 FDD | R.PDCCH.1-2.7 FDD |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| CORESET frequency domain allocation |  | 24 | 24 | 24 | 48 | 48 | 48 | 48 |
| CORESET time domain allocation |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Aggregation level |  | 2 | 4 | 2 | 4 | 8 | 16 | 8 |
| DCI Format |  | 1\_0 | 1\_0 | 1\_1 | 1\_1 | 1\_1 | 1\_0 | 2\_6 |
| Payload (without CRC) | Bits | 39 | 39 | 52 | 52 | 52 | 39 | 12 |

Table A.3.3.1.1-3: Additional PDSCH Reference Channel FDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| DCI Format |  | 1\_0 | 1\_1 |
| Channel bandwidth | MHz | 10 | 10 |
| Subcarrier spacing | kHz | 15 | 15 |
| Number of allocated resource blocks | PRBs | 52 | 52 |
| Number of consecutive PDSCH symbols |  | 12 | 12 |
| Allocated slots per 2 frames | Slots | 19 | 19 |
| MCS table |  | 64QAM | 64QAM |
| MCS index |  | 4 | 4 |
| Modulation |  | QPSK | QPSK |
| Target Coding Rate |  | 0.30 | 0.30 |
| Number of MIMO layers |  | 1 | 1 |
| Number of DMRS REs |  | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 3368 | 4096 |
| Transport block CRC per Slot |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A |
| For Slots i = 1,…, 19 | Bits | 16 | 24 |
| Number of Code Blocks per Slot |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A |
| For Slots i = 1,…, 19 | CBs | 1 | 1 |
| Binary Channel Bits Per Slot |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A |
| For Slots i = 10, 11 | Bits | 9984 | 13104 |
| For Slots i = 1,…, 9, 12, …, 19 | Bits | 11232 | 13728 |
| Max. Throughput averaged over 2 frames | Mbps | 3.1996 | 3.8912 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames.  Note 3: For PDSCH & PDSCH DMRS precoding the following configuration shall be used: Single Panel Type I, Random precoder selection updated per slot, with equal probability of each applicable i1, i2 combination, and with PRB bundling granularity.  Note 4: For tests with DRX configured, PDCCH and PDSCH shall only be scheduled during the DRX on duration of the test. | | | |

#### A.3.3.1.2 Reference measurement channels for SCS 30 kHz FR1

Table A.3.3.1.2-1: PDCCH Reference Channels (Time domain allocation 1 symbol)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.PDCCH.2-1.1 FDD | R.PDCCH.2-1.2 FDD | R.PDCCH.2-1.3 FDD |  |  |  |
| Subcarrier spacing | kHz | 30 | 30 | 30 |  |  |  |
| CORESET frequency domain allocation |  | 102 | 102 | 90 |  |  |  |
| CORESET time domain allocation |  | 1 | 1 | 1 |  |  |  |
| Aggregation level |  | 2 | 4 | 8 |  |  |  |
| DCI Format |  | 1\_0 | 1\_1 | 1\_1 |  |  |  |
| Payload (without CRC) | Bits | 41 | 53 | 53 |  |  |  |

Table A.3.3.1.2-2: PDCCH Reference Channel (Time domain allocation 2 symbols)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.PDCCH.2-2.1 FDD |  |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |  |
| CORESET frequency domain allocation |  | 48 |  |  |  |  |  |
| CORESET time domain allocation |  | 2 |  |  |  |  |  |
| Aggregation level |  | 16 |  |  |  |  |  |
| DCI Format |  | 1\_0 |  |  |  |  |  |
| Payload (without CRC) | Bits | 41 |  |  |  |  |  |

### A.3.3.2 TDD

#### A.3.3.2.1 Reference measurement channels for SCS 15 kHz FR1

Table A.3.3.2.1-1: PDCCH Reference Channels (Time domain allocation 1 symbol)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.PDCCH.1-1.1 TDD | R.PDCCH.1-1.2 TDD | R.PDCCH.1-1.3 TDD |  |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 |  |  |  |
| CORESET frequency domain allocation |  | 48 | 48 | 48 |  |  |  |
| CORESET time domain allocation |  | 1 | 1 | 1 |  |  |  |
| Aggregation level |  | 4 | 4 | 8 |  |  |  |
| DCI Format |  | 1\_0 | 1\_1 | 1\_1 |  |  |  |
| Payload (without CRC) | Bits | 39 | 52 | 52 |  |  |  |

Table A.3.3.2.1-2: PDCCH Reference Channel (Time domain allocation 2 symbols)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.PDCCH.1-2.1 TDD | R.PDCCH.1-2.2 TDD | R.PDCCH.1-2.3 TDD | R.PDCCH.1-2.4 TDD | R.PDCCH.1-2.5 TDD | R.PDCCH.1-2.6 TDD |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 | 15 |
| CORESET frequency domain allocation |  | 24 | 24 | 24 | 48 | 48 | 48 |
| CORESET time domain allocation |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Aggregation level |  | 2 | 4 | 2 | 4 | 8 | 16 |
| DCI Format |  | 1\_0 | 1\_0 | 1\_1 | 1\_1 | 1\_1 | 1\_0 |
| Payload (without CRC) | Bits | 39 | 39 | 52 | 52 | 52 | 39 |

#### A.3.3.2.2 Reference measurement channels for SCS 30 kHz FR1

Table A.3.3.2.2-1: PDCCH Reference Channels (Time domain allocation 1 symbol)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.PDCCH.2-1.1 TDD | R.PDCCH.2-1.2 TDD | R.PDCCH.2-1.3 TDD | R.PDCCH.2-1.4 TDD | R.PDCCH.2-1.5 TDD | R.PDCCH.2-1.6 TDD |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 | 30 |
| CORESET frequency domain allocation |  | 102 | 102 | 90 | 102 | 48 | 48 |
| CORESET time domain allocation |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Aggregation level |  | 2 | 4 | 8 | 8 | 4 | 8 |
| DCI Format |  | 1\_0 | 1\_1 | 1\_1 | 2\_6 | 1\_1 | 1\_1 |
| Payload (without CRC) | Bits | 41 | 53 | 53 | 12 | 53 | 53 |

Table A.3.3.2.2-2: PDCCH Reference Channel (Time domain allocation 2 symbols)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.PDCCH.2-2.1 TDD |  |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |  |
| CORESET frequency domain allocation |  | 48 |  |  |  |  |  |
| CORESET time domain allocation |  | 2 |  |  |  |  |  |
| Aggregation level |  | 16 |  |  |  |  |  |
| DCI Format |  | 1\_0 |  |  |  |  |  |
| Payload (without CRC) | Bits | 41 |  |  |  |  |  |

Table A.3.3.2.2-3: Additional PDSCH Reference Channel TDD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| DCI Format |  | 1-0 | 1-1 | 1-1 |
| TDD UL/DL pattern |  | FR1.30-1 | FR1.30-1 | FR1.30-1 |
| Channel bandwidth | MHz | 40 | 40 | 20 |
| Subcarrier spacing | kHz | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 106 | 106 | 51 |
| Number of consecutive PDSCH symbols |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 | 4 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6) for i from {1,…,39} |  | 12 | 12 | 12 |
| Allocated slots per 2 frames |  | 31 | 31 | 31 |
| MCS table |  | 64QAM | 64QAM | 64QAM |
| MCS index |  | 4 | 4 | 4 |
| Modulation |  | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 0.30 | 0.3 | 0.3 |
| Number of MIMO layers |  | 1 | 1 | 1 |
| Number of DMRS rEs |  |  |  |  |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 6 | 6 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6) for i from {1,…,39} |  | 12 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 2280 | 2664 | 1288 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6) for i from {1,…,39} | Bits | 6912 | 8456 | 4032 |
| Transport block CRC per Slot |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 16 | 16 | 16 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6) for i from {1,…,39} | Bits | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 1 | 1 | 1 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6) for i from {1,…,39} | CBs | 1 | 2 | 1 |
| Binary Channel Bits Per Slot |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 7488 | 8904 | 4284 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6) for i from {1,…,39} | Bits | 22896 | 27984 | 13464 |
| Max. Throughput averaged over 2 frames | Mbps | 9.78 | 11.94 | 5.70 |
| Note 1: For PDSCH & PDSCH DMRS precoding the following configuration shall be used: Single Panel Type I, Random precoder selection updated per slot, with equal probability of each applicable i1, i2 combination, and with PRB bundling granularity.  Note 2: For tests with DRX configured, PDCCH and PDSCH shall only be scheduled during the DRX on duration of the test. | | | | |

#### A.3.3.2.3 Reference measurement channels for SCS 60 kHz FR1

#### A.3.3.2.4 Reference measurement channels for SCS 60 kHz FR2

#### A.3.3.2.5 Reference measurement channels for SCS 120 kHz FR2

Table A.3.3.2.5-1: PDCCH Reference Channels (Time domain allocation 1 symbol)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.PDCCH.5-1.1 TDD | R.PDCCH.5-1.2 TDD | R.PDCCH.5-1.3 TDD | R.PDCCH.5-1.4 TDD |  |  |
| Subcarrier spacing | kHz | 120 | 120 | 120 | 120 |  |  |
| CORESET frequency domain allocation |  | 60 | 60 | 60 | 60 |  |  |
| CORESET time domain allocation |  | 1 | 1 | 1 | 1 |  |  |
| Aggregation level |  | 2 | 4 | 8 | 8 |  |  |
| DCI Format |  | 1\_0 | 1\_1 | 1\_1 | 2\_6 |  |  |
| Payload (without CRC) | Bits | 40 | 56 | 56 | 12 |  |  |

Table A.3.3.2.5-2: PDCCH Reference Channel (Time domain allocation 2 symbols)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.PDCCH.5-2.1 TDD |  |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |  |
| CORESET frequency domain allocation |  | 60 |  |  |  |  |  |
| CORESET time domain allocation |  | 2 |  |  |  |  |  |
| Aggregation level |  | 16 |  |  |  |  |  |
| DCI Format |  | 1\_0 |  |  |  |  |  |
| Payload (without CRC) | Bits | 40 |  |  |  |  |  |

Table A.3.3.2.5-3: Additional PDSCH Reference Channel TDD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| DCI format |  | DCI 1\_0 | DCI 1\_1 | DCI 1\_0 Test 2-2 |
| TDD UL/DL pattern |  |  |  |  |
| Channel bandwidth | MHz | 100 | 100 | 100 |
| Subcarrier spacing | kHz | 120 | 120 | 120 |
| Allocated resource blocks | PRBs | 66 | 66 | 66 |
| Number of consecutive PDSCH symbols |  |  |  |  |
| For Slots 0, 5 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} |  | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 9 | 9 | 8 |
| For Slot i, if mod(i, 5) = {1,2} for i from {1,…,159} |  | 13 | 13 | 12 |
| For Slot i, if mod(i, 5) = {0} for i from {6,…,159} |  | 13 | 13 | 12 |
| Allocated slots per 2 frames |  | 126 | 126 | 126 |
| MCS table |  | 64QAM | 64QAM | 64QAM |
| MCS index |  | 4 | 4 | 4 |
| Modulation |  | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 0.30 | 0.30 | 0.30 |
| Number of MIMO layers |  | 1 | 1 | 1 |
| Number of DMRS REs |  |  |  |  |
| For Slots 0, 5 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} |  | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 12 | 12 | 12 |
| For Slot i, if mod(i, 5) = {1,2} for i from {1,…,159} |  | 12 | 12 | 12 |
| For Slot i, if mod(i, 5) = {0} for i from {6,…,159} |  | 12 | 12 | 12 |
| Overhead for TBS determination |  | 6 | 6 | 6 |
| Information Bit Payload per Slot |  |  |  |  |
| For Slots 0, 5 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 3104 | 3624 | 2152 |
| For Slot i, if mod(i, 5) = {1,2} for i from {1,…,159} | Bits | 4480 | 5504 | 4032 |
| For Slot i, if mod(i, 5) = {0} for i from {6,…,159} |  | 4480 | 5504 | 4032 |
| Transport block CRC per Slot |  |  |  |  |
| For Slots 0, 5 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 16 | 16 | 16 |
| For Slot i, if mod(i, 5) = {1,2} for i from {1,…,159} | Bits | 24 | 24 | 24 |
| For Slot i, if mod(i, 5) = {0} for i from {6,…,159} |  | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |
| For Slots 0, 5 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | CBs | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | CBs | 1 | 1 | 1 |
| For Slot i, if mod(i, 5) = {1,2} for i from {1,…,159} | CBs | 1 | 1 | 1 |
| For Slot i, if mod(i, 5) = {0} for i from {6,…,159} |  | 1 | 1 | 1 |
| Binary Channel Bits Per Slot |  |  |  |  |
| For Slots 0, 5 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A | N/A |
| For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 10296 | 11880 | 7128 |
| For Slot i, if mod(i, 5) = {1,2} for i from {1,…,159} | Bits | 15048 | 18216 | 13464 |
| For Slot i, if mod(i, 5) = {0} for i from {6,…,159} |  | 15048 | 18216 | 13464 |
| Max. Throughput averaged over 2 frames | Mbps | 26,022 | 31.667 | 22,796 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms.  Note 2: Slot i is slot index per 2 frames  Note 3: For PDSCH & PDSCH DMRS precoding the following configuration shall be used: Single Panel Type I, Random precoder selection updated per slot, with equal probability of each applicable i1, i2 combination, and with Wideband granularity. | | | |  |

## A.3.4 Reference measurement channels for PBCH demodulation requirements

### A.3.4.1 Reference measurement channels for FR1

Table A.3.4.1-1: PBCH Reference Channel

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.PBCH.1 | R.PBCH.2 |
| SS/PBCH block subcarrier spacing | kHz | 15 | 30 |
| Modulation |  | QPSK | QPSK |
| Target coding rate |  | 56/864 | 56/864 |
| Payload (without CRC and timing related PBCH payload bits) | bits | 24 | 24 |

### A.3.4.2 Reference measurement channels for FR2

Table A.3.4.2-1: PBCH Reference Channel

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channels |  | R.PBCH.5 | R.PBCH.6 |
| SS/PBCH block subcarrier spacing | kHz | 120 | 240 |
| Modulation |  | QPSK | QPSK |
| Target coding rate |  | 56/864 | 56/864 |
| Payload (without CRC and timing related PBCH payload bits) | bits | 24 | 24 |

# A.4 CSI reference measurement channels

This section defines the DL signal applicable to the reporting of channel status information (Clauses6 and 8).

Tables in this section specifies the mapping of CQI index to Information Bit payload, which complies with the CQI definition specified in clause 5.2.2.1 of TS 38.214 [12] and with MCS definition specified in clause 5.1.3 of TS 38.214 [12]

Table A.4-1: Mapping of CQI Index to Information Bit payload (CQI table 1)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TBS Scheme | | | | TBS.1-1 | TBS.1-2 | TBS.1-3 | TBS.1-4 | TBS.1-5 | TBS.1-6 |
| MCS table | | | | 64QAM | | | | | |
| Number of allocated PDSCH resource blocks | | | | 66 | 66 | 52 | 52 | 51 | 51 |
| Number of consecutive PDSCH symbols | | | | 12 | 12 | 12 | 12 | 12 | 12 |
| Number of PDSCH MIMO layers | | | | 1 | 2 | 1 | 2 | 1 | 2 |
| Number of DMRS REs (Note 1) | | | | 24 | 24 | 24 | 24 | 24 | 24 |
| Overhead for TBS determination | | | | 6 | 6 | 0 | 0 | 0 | 0 |
| Available RE-s | | | | 7590 | 7590 | 6240 | 6240 | 6120 | 6120 |
| CQI index | Spectral efficiency | MCS index | Modulation | Information Bit Payload per Slot | | | | | |
| 0 | OOR | OOR | OOR | N/A | N/A | N/A | N/A | N/A | N/A |
| 1 | 0.2344 | 0 | QPSK | 1800 | 3624 | 1480 | 2976 | 1480 | 2856 |
| 2 | 0.2344 | 0 | 1800 | 3624 | 1480 | 2976 | 1480 | 2856 |
| 3 | 0.3770 | 2 | 2856 | 5640 | 2408 | 4744 | 2408 | 4616 |
| 4 | 0.6016 | 4 | 4480 | 8968 | 3752 | 7424 | 3752 | 7296 |
| 5 | 0.8770 | 6 | 6528 | 13064 | 5504 | 11016 | 5376 | 10760 |
| 6 | 1.1758 | 8 | 8712 | 17928 | 7296 | 14600 | 7168 | 14344 |
| 7 | 1.4766 | 11 | 16QAM | 11016 | 22032 | 9224 | 18432 | 8968 | 17928 |
| 8 | 1.9141 | 13 | 14344 | 28680 | 12040 | 24072 | 11784 | 23568 |
| 9 | 2.4063 | 15 | 17928 | 35856 | 15112 | 30216 | 14600 | 29192 |
| 10 | 2.7305 | 18 | 64QAM | 20496 | 40976 | 16896 | 33816 | 16896 | 33816 |
| 11 | 3.3223 | 20 | 25104 | 50184 | 20496 | 40976 | 20496 | 40976 |
| 12 | 3.9023 | 22 | 29192 | 58384 | 24576 | 49176 | 24072 | 48168 |
| 13 | 4.5234 | 24 | 33816 | 67584 | 28168 | 56368 | 27656 | 55304 |
| 14 | 5.1152 | 26 | 38936 | 77896 | 31752 | 63528 | 31240 | 62504 |
| 15 | 5.5547 | 28 | 42016 | 83976 | 34816 | 69672 | 33816 | 67584 |
| Note 1: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data  Note 2: PDSCH is not scheduled on slots containing CSI-RS for tracking, CSI-RS for CSI acquisition and CSI-RS for beam refinement or slots which are not full DL  Note 3: PDSCH is not scheduled on slots containing PBCH, i.e. slot#0 per 20ms periodicity  Note 4: Spectral efficiency is based on MCS Table defined in Table 5.1.3.1-1 of TS 38.214 [12] | | | | | | | | | |

Table A.4-2: Mapping of CQI Index to Information Bit payload (CQI table 2, Rank 1 and Rank 2)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TBS Scheme | | | | TBS.2-1 | TBS.2-2 | TBS.2-3 | TBS.2-4 | TBS.2-5 | TBS.2-6 | TBS.2-7 | TBS.2-8 |
| MCS table | | | | 256QAM | | | | | | | |
| Number of allocated PDSCH resource blocks | | | | 52 | 52 | 106 | 106 | 8 | 16 | 32 | 51 |
| Number of consecutive PDSCH symbols | | | | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Number of PDSCH MIMO layers | | | | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 2 |
| Number of DMRS REs (Note 1) | | | | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| Overhead for TBS determination | | | | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| Available RE-s for PDSCH | | | | 6240 | 6240 | 12720 | 12720 | 960 | 1920 | 3680 | 6120 |
| CQI index | Spectral efficiency | MCS index | Modulation | Information Bit Payload per Slot | | | | | | |  |
| 0 | OOR | OOR | OOR | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 1 | 0.2344 | 0 | QPSK | 1480 | 2976 | 2976 | 5896 | 224 | 456 | 848 | 2856 |
| 2 | 0.3770 | 1 | 2408 | 4744 | 4744 | 9480 | 368 | 736 | 1416 | 4616 |
| 3 | 0.8770 | 3 | 5504 | 11016 | 11016 | 22536 | 848 | 1736 | 3240 | 10760 |
| 4 | 1.4766 | 5 | 16QAM | 9224 | 18432 | 18960 | 37896 | 1416 | 2856 | 5376 | 17928 |
| 5 | 1.9141 | 7 | 12040 | 24072 | 24576 | 49176 | 1864 | 3752 | 6912 | 23568 |
| 6 | 2.4063 | 9 | 15112 | 30216 | 30728 | 61480 | 2408 | 4608 | 8712 | 29192 |
| 7 | 2.7305 | 11 | 64QAM | 16896 | 33816 | 34816 | 69672 | 2600 | 5248 | 9992 | 33816 |
| 8 | 3.3223 | 13 | 20496 | 40976 | 42016 | 83976 | 3240 | 6400 | 12040 | 40976 |
| 9 | 3.9023 | 15 | 24576 | 49176 | 49176 | 98376 | 3752 | 7424 | 14344 | 48168 |
| 10 | 4.5234 | 17 | 28168 | 56368 | 57376 | 114776 | 4352 | 8712 | 16392 | 55304 |
| 11 | 5.1152 | 19 | 31752 | 63528 | 65576 | 131176 | 4864 | 9736 | 18432 | 62504 |
| 12 | 5.5547 | 21 | 256QAM | 34816 | 69672 | 69672 | 139376 | 5248 | 10760 | 20496 | 67584 |
| 13 | 6.2266 | 23 | 38936 | 77896 | 79896 | 159880 | 6016 | 12040 | 22536 | 75792 |
| 14 | 6.9141 | 25 | 43032 | 86040 | 88064 | 176208 | 6656 | 13320 | 25104 | 83976 |
| 15 | 7.4063 | 27 | 46104 | 92200 | 94248 | 188576 | 7040 | 14088 | 27144 | 90176 |
| Note 1: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data  Note 2: PDSCH is not scheduled on slots containing CSI-RS for tracking, CSI-RS for CSI acquisition and CSI-RS for beam refinement or slots which are not full DL  Note 3: PDSCH is not scheduled on slots containing PBCH, i.e. slot#0 per 20ms periodicity  Note 4: Spectral efficiency is based on MCS Table defined in Table 5.1.3.1-2 of TS 38.214 [12] | | | | | | | | | | | |

**Table A.4-3: Mapping of CQI Index to Information Bit payload (CQI table 2, Rank 3 and Rank 4)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TBS Scheme | | | | TBS.3-1 | TBS.3-2 | TBS.3-3 | TBS.3-4 |  |  |
| MCS table | | | | 256QAM | | | | | |
| Number of allocated PDSCH resource blocks | | | | 52 | 52 | 106 | 106 |  |  |
| Number of consecutive PDSCH symbols | | | | 12 | 12 | 12 | 12 |  |  |
| Number of PDSCH MIMO layers | | | | 3 | 4 | 3 | 4 |  |  |
| Number of DMRS REs (Note 1) | | | | 24 | 24 | 24 | 24 |  |  |
| Overhead for TBS determination | | | | 0 | 0 | 0 | 0 |  |  |
| Available RE-s for PDSCH | | | | 6240 | 6240 | 12720 | 12720 |  |  |
| CQI index | Spectral efficiency | MCS index | Modulation | Information Bit Payload per Slot | | | | | |
| 0 | OOR | OOR | OOR | N/A | N/A | N/A | N/A |  |  |
| 1 | 0.2344 | 0 | QPSK | 4360 | 5896 | 8976 | 11784 |  |  |
| 2 | 0.3770 | 1 | 7048 | 9480 | 14344 | 18976 |  |  |
| 3 | 0.8770 | 3 | 16392 | 22032 | 33816 | 45096 |  |  |
| 4 | 1.4766 | 5 | 16QAM | 27656 | 36896 | 56368 | 75792 |  |  |
| 5 | 1.9141 | 7 | 35856 | 48168 | 73776 | 98376 |  |  |
| 6 | 2.4063 | 9 | 45096 | 60456 | 92200 | 122976 |  |  |
| 7 | 2.7305 | 11 | 64QAM | 51216 | 67584 | 104496 | 139376 |  |  |
| 8 | 3.3223 | 13 | 62504 | 81976 | 127080 | 167976 |  |  |
| 9 | 3.9023 | 15 | 73776 | 98376 | 147576 | 196776 |  |  |
| 10 | 4.5234 | 17 | 83976 | 112648 | 172176 | 229576 |  |  |
| 11 | 5.1152 | 19 | 96264 | 127080 | 196776 | 262376 |  |  |
| 12 | 5.5547 | 21 | 256QAM | 104496 | 139376 | 213176 | 278776 |  |  |
| 13 | 6.2266 | 23 | 116792 | 155776 | 237776 | 319784 |  |  |
| 14 | 6.9141 | 25 | 129128 | 172176 | 262376 | 352440 |  |  |
| 15 | 7.4063 | 27 | 139376 | 184424 | 278776 | 376896 |  |  |
| Note 1: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data  Note 2: PDSCH is not scheduled on slots containing CSI-RS for tracking, CSI-RS for CSI acquisition and CSI-RS for beam refinement or slots which are not full DL  Note 3: PDSCH is not scheduled on slots containing PBCH, i.e. slot#0 per 20ms periodicity  Note 4: Spectral efficiency is based on MCS Table defined in Table 5.1.3.1-2 of TS 38.214 [12] | | | | | | | | | |

Table A.4-4: Mapping of CQI Index to Information Bit payload (CQI table 3)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TBS Scheme | | | | TBS.4-1 | TBS.4-2 |  |  |  |  |
| MCS table | | | | 64QAMLowSE | | | | | |
| Number of allocated PDSCH resource blocks | | | | 52 | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols | | | | 12 | 12 |  |  |  |  |
| Number of PDSCH MIMO layers | | | | 1 | 1 |  |  |  |  |
| Number of DMRS REs (Note 1) | | | | 24 | 24 |  |  |  |  |
| Overhead for TBS determination | | | | 0 | 0 |  |  |  |  |
| Available RE-s for PDSCH | | | | 6240 | 12720 |  |  |  |  |
| CQI index | Spectral efficiency | MCS index | Modulation | Information Bit Payload per Slot | | | | | |
| 0 | OOR | OOR | OOR | N/A | N/A |  |  |  |  |
| 1 | 0.0586 | 0 | QPSK | 368 | 768 |  |  |  |  |
| 2 | 0.0977 | 2 | 608 | 1256 |  |  |  |  |
| 3 | 0.1523 | 4 | 984 | 2024 |  |  |  |  |
| 4 | 0.2344 | 6 | 1480 | 2976 |  |  |  |  |
| 5 | 0.3770 | 8 | 2408 | 4744 |  |  |  |  |
| 6 | 0.6016 | 10 | 3752 | 7680 |  |  |  |  |
| 7 | 0.8770 | 12 | 5504 | 11016 |  |  |  |  |
| 8 | 1.1758 | 14 | 7296 | 14856 |  |  |  |  |
| 9 | 1.4766 | 16 | 16QAM | 9224 | 18960 |  |  |  |  |
| 10 | 1.9141 | 18 | 12040 | 24576 |  |  |  |  |
| 11 | 2.4063 | 20 | 15112 | 30728 |  |  |  |  |
| 12 | 2.7305 | 22 | 64QAM | 16896 | 34816 |  |  |  |  |
| 13 | 3.3223 | 24 | 20496 | 42016 |  |  |  |  |
| 14 | 3.9023 | 26 | 24576 | 49176 |  |  |  |  |
| 15 | 4.5234 | 28 | 28168 | 57376 |  |  |  |  |
| Note 1: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data.  Note 2: PDSCH is not scheduled on slots containing CSI-RS for tracking and CSI-RS for CSI acquisition or slots which are not full DL.  Note 3: PDSCH is not scheduled on slots containing PBCH, i.e. slot#0 per 20ms periodicity. | | | | | | | | | |

Table A.4-5: Mapping of CQI Index to Information Bit payload (CQI table 4)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TBS Scheme | | | | TBS.5-1 | TBS.5-2 |  |  |  |  |
| MCS table | | | | 1024QAM | | | | | |
| Number of allocated PDSCH resource blocks | | | | 52 | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols | | | | 12 | 12 |  |  |  |  |
| Number of PDSCH MIMO layers | | | | 1 | 1 |  |  |  |  |
| Number of DMRS REs (Note 1) | | | | 24 | 24 |  |  |  |  |
| Overhead for TBS determination | | | | 0 | 0 |  |  |  |  |
| Available RE-s | | | | 6240 | 12720 |  |  |  |  |
| CQI index | Spectral efficiency | MCS index | Modulation | Information Bit Payload per Slot | | | | | |
| 0 | OOR | OOR | OOR | N/A | N/A |  |  |  |  |
| 1 | 0.2344 | 0 | QPSK | 1480 | 2976 |  |  |  |  |
| 2 | 0.377 | 1 | 2408 | 4744 |  |  |  |  |
| 3 | 0.877 | 2 | 5504 | 11016 |  |  |  |  |
| 4 | 1.4766 | 3 | 16QAM | 9224 | 18960 |  |  |  |  |
| 5 | 2.4063 | 5 | 15112 | 30728 |  |  |  |  |
| 6 | 3.3223 | 8 | 64QAM | 20496 | 42016 |  |  |  |  |
| 7 | 3.9023 | 10 | 24576 | 49176 |  |  |  |  |
| 8 | 4.5234 | 12 | 28168 | 57376 |  |  |  |  |
| 9 | 5.1152 | 14 | 31752 | 65576 |  |  |  |  |
| 10 | 5.5547 | 16 | 256QAM | 34816 | 69672 |  |  |  |  |
| 11 | 6.2266 | 18 | 38936 | 79896 |  |  |  |  |
| 12 | 6.9141 | 20 | 43032 | 88064 |  |  |  |  |
| 13 | 7.4063 | 22 | 46104 | 94248 |  |  |  |  |
| 14 | 8.3301 | 24 | 1024QAM | 52224 | 106576 |  |  |  |  |
| 15 | 9.2578 | 26 | 57376 | 116792 |  |  |  |  |
| Note 1: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data  Note 2: PDSCH is not scheduled on slots containing CSI-RS for tracking, CSI-RS for CSI acquisition and CSI-RS for beam refinement or slots which are not full DL  Note 3: PDSCH is not scheduled on slots containing PBCH, i.e. slot#0 per 20ms periodicity  Note 4: Spectral efficiency is based on MCS Table defined in Table 5.1.3.1-4 of TS 38.214 [12] | | | | | | | | | |

# A.5 OFDMA Channel Noise Generator (OCNG)

## A.5.1 OCNG Patterns for FDD

### A.5.1.1 OCNG FDD pattern 1: Generic OCNG FDD Pattern for all unused REs

Table A.5.1.1-1: OP.1 FDD: Generic OCNG FDD Pattern for all unused REs

|  |  |  |
| --- | --- | --- |
| OCNG Appliance  OCNG Parameters | Control Region  (CORESET) | Data Region |
| Resources allocated | All unused REs (Note 1) | All unused REs (Note 2) |
| Structure | PDCCH | PDSCH |
| Content | Uncorrelated pseudo random QPSK modulated data | Uncorrelated pseudo random QPSK modulated data |
| Transmission scheme for multiple  antennas ports transmission | Single Tx port transmission | Spatial multiplexing using any precoding matrix with dimensions same as the precoding matrix for PDSCH |
| Subcarrier Spacing | Same as for RMC PDCCH in the active BWP | Same as for RMC PDSCH in the active BWP |
| Power Level | Same as for RMC PDCCH | Same as for RMC PDSCH |
| Note 1: All unused REs in the active CORESETS appointed by the search spaces in use.  Note 2: Unused available REs refer to REs in PRBs not allocated for any physical channels, CORESETs, synchronization signals or reference signals, and excluding REs in all the available PDSCH DMRS CDM groups, in channel bandwidth. | | |

## A.5.2 OCNG Patterns for TDD

### A.5.2.1 OCNG TDD pattern 1: Generic OCNG TDD Pattern for all unused REs

Table A.5.2.1-1: OP.1 TDD: Generic OCNG TDD Pattern for all unused REs

|  |  |  |
| --- | --- | --- |
| OCNG Appliance  OCNG Parameters | Control Region  (CORESET) | Data Region |
| Resources allocated | All unused REs (Note 1) | All unused REs (Note 2) |
| Structure | PDCCH | PDSCH |
| Content | Uncorrelated pseudo random QPSK modulated data | Uncorrelated pseudo random QPSK modulated data |
| Transmission scheme for multiple antennas ports transmission | Single Tx port transmission | Spatial multiplexing using any precoding matrix with dimensions same as the precoding matrix for PDSCH |
| Subcarrier Spacing | Same as for RMC PDCCH in the active BWP | Same as for RMC PDSCH in the active BWP |
| Power Level | Same as for RMC PDCCH | Same as for RMC PDSCH |
| Note 1: All unused REs in the active CORESETS appointed by the search spaces in use.  Note 2: Unused available REs refer to REs in PRBs not allocated for any physical channels, CORESETs, synchronization signals or reference signals, and excluding REs in all the available PDSCH DMRS CDM groups, in channel bandwidth. | | |

# A.6 SL reference measurement channels

## A.6.1 General

The transport block size (TBS) determination procedure is described in clause 8.1.3 of TS 38.214 [12].

## A.6.2 Reference measurement channels for PSSCH performance requirements

### A.6.2.1 Reference measurement channels for SCS 15 kHz FR1

FFS

### A.6.2.2 Reference measurement channels for SCS 30 kHz FR1

Table A.6.2.2-1: PSSCH Reference Channel

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | | |
| Reference channel | |  | R.PSSCH.2-1.1 | R.PSSCH.2-1.2 | R.PSSCH.2-1.3 | R.PSSCH.2-1.4 | R.PSSCH.2-1.5 |
| Channel bandwidth | | MHz | 20 | 20 | 20 | 20 | 20 |
| Subcarrier spacing | | kHz | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | | RB | 20 | 20 | 10 | 10 | 10 |
| CP-OFDM symbols for slot with PSFCH(Note 1) | |  | 9 | 9 | 9 | 9 | 9 |
| CP-OFDM symbols for slot without PSFCH | |  | 12 | 12 | 12 | 12 | - |
| Modulation order | |  | QPSK | 16QAM | 64QAM | QPSK | 64QAM |
| MCS index | |  | 4 | 11 | 17 | 4 | 27 |
| Number of MIMO layers | |  | 1 | 1 | 1 | 1 | 1 |
| Number of DMRS REs | |  | 21 | 15 | 12 | 15 | 12 |
| Number of REs for SCI format 1-A | |  | 240 | 240 | 240 | 240 | 240 |
| 2nd stage SCI format 2-A configuration | Payloads | Bits | 35 | 35 | 35 | 35 | 35 |
| *α* |  | 1 | 1 | 1 | 1 | 1 |
| *βoffset* |  | 3.5 | 5 | 5 | 3.5 | 2.5 |
| Overhead for TBS determination | |  | 0 | 0 | 0 | 0 | 0 |
| Transport Block Size for slot with PSFCH | | Bits | 704 | 1800 | 984 | 208 | 3496 |
| Transport Block Size for slot without PSFCH | | Bits | 1128 | 2856 | 1928 | 432 | - |
| Transport block CRC | | Bits | 24 | 24 | 24 | 24 | 16 |
| Maximum number of HARQ transmissions | |  | 1 | 1 | 1 | 1 | 2 |
| Binary Channel Bits for slots with PSFCH | |  | 2304 | 4848 | 2232 | 744 | 3816 |
| Binary Channel Bits for slots without PSFCH | | Bits | 3744 | 7728 | 4392 | 1464 | - |
| Note 1: OFDM symbols is for PSCCH/PSSCH transmission not including first symbol (AGC), PSFCH symbols, and guard symbols. | | | | | | | |

## A.6.3 Reference measurement channels for PSCCH performance requirements

### A.6.3.1 Reference measurement channels for SCS 15 kHz FR1

FFS

### A.6.3.2 Reference measurement channels for SCS 30 kHz FR1

Table A.6.3.2-1: PSCCH Reference Channel

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.PSCCH.2-1.1 |
| Allocated resource blocks | PRBs | 10 |
| OFDM Symbols per slot (Note 2) | Symbols | 2 |
| Modulation |  | QPSK |
| Payload (without CRC) | Bits | 26 |
| CRC | Bits | 24 |
| SCI Format |  | 1-A |
| Binary Channel Bits | Bits | 180 |
| NOTE 1: The first OFDM symbol of a PSSCH and its associated PSCCH is duplicated as described in clauses 8.3.1.5 and 8.3.2.3 of TS 38.211 [9]. This symbol is used for AGC and not used for demodulation.  NOTE 2: First OFDM symbol is not included. | | |

## A.6.4 Reference measurement for PSBCH performance requirements

### A.6.4.1 Reference measurement channels for SCS 15 kHz FR1

FFS

### A.6.4.2 Reference measurement channels for SCS 30 kHz FR1

Table A.6.4.2-1: PSBCH Reference Channel

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.PSBCH.2-1 |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks | PRBs | 11 |
| CP-OFDM Symbols per slot (see Note 1) | Symbols | 8 |
| Modulation |  | QPSK |
| Transport Block Size (without CRC) | Bits | 32 |
| Transport block CRC | Bits | 24 |
| Binary Channel Bits | Bits | 1782 |
| Note 1: PSBCH transmissions are rate-matched for 9 CP-OFDM symbols per slot. The first symbol is used for AGC and the last symbol is gap and shall not be used for PSBCH transmission as per TS 38.211 [9]. | | |

Annex B (normative):  
Propagation conditions

# B.0 No interference

The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects.

# B.1 Static propagation condition

## B.1.0 UE Receiver with 1Rx

For 2 port transmission the channel matrix is defined in the frequency domain by

..

For 4 port transmission the channel matrix is defined in the frequency domain by

**H** = [1 1 j j]

For 8 port transmission the channel matrix is defined in the frequency domain by

**H** = [1 1 1 1 j j j j]

## B.1.1 UE Receiver with 2Rx

For 1 port transmission the channel matrix is defined in the frequency domain by:

.

For 2 port transmission the channel matrix is defined in the frequency domain by:

.

For 4 port transmission the channel matrix is defined in the frequency domain by:



For 8 port transmission the channel matrix is defined in the frequency domain by:



## B.1.2 UE Receiver with 4Rx

For 1 port transmission the channel matrix is defined in the frequency domain by:

.

For 2 port transmission the channel matrix is defined in the frequency domain by:

.

For 4 port transmission the channel matrix is defined in the frequency domain by:

.

For 8 port transmission the channel matrix is defined in the frequency domain by:



# B.2 Multi-path fading propagation conditions

The multipath propagation conditions consist of several parts:

- A delay profile in the form of a "tapped delay-lin", characterized by a number of taps at fixed positions on a sampling grid. The profile can be further characterized by the r.m.s. delay spread and the maximum delay spanned by the taps.

- A combination of channel model parameters that include the Delay profile and the Doppler spectrum that is characterized by a classical spectrum shape and a maximum Doppler frequency.

- Different models are used for FR1 and FR2.

Initial channel matrix for LOS component of TDL-D channel model is equal to channel matrix of Static propagation conditions in Clause B.1.

## B.2.1 Delay profiles

The delay profiles are simplified from the TR 38.901 [15] TDL models. The simplification steps are shown below for information. These steps are only used when new delay profiles are created. Otherwise, the delay profiles specified in B.2.1.1 and B.2.1.2 can be used as such.

Step 1: Use the original TDL model from TR38.901 [15].

Step 2: Re-order the taps in ascending delays

Step 3: Perform delay scaling according to the procedure described in subclause 7.7.3 in TR 38.901 [15].

Step 4: Apply the quantization to the delay resolution 5 ns. This is done simply by rounding the tap delays to the nearest multiple of the delay resolution.

Step 5: If multiple taps are rounded to the same delay bin, merge them by calculating their linear power sum.

Step 6: If there are more than 12 taps in the quantized model, merge the taps as follows:

- Find the weakest tap from all taps (both merged and unmerged taps are considered)

- If there are two or more taps having the same value and are the weakest, select the tap with the smallest delay as the weakest tap.

- When the weakest tap is the first delay tap, merge taps as follows:

- Update the power of the first delay tap as the linear power sum of the weakest tap and the second delay tap.

- Remove the second delay tap.

- When the weakest tap is the last delay tap, merge taps as follows:

- Update the power of the last delay tap as the linear power sum of the second-to-last tap and the last tap.

- Remove the second-to-last tap.

- Otherwise

- For each side of the weakest tap, identify the neighbour tap that has the smaller delay difference to the weakest tap.

- When the delay difference between the weakest tap and the identified neighbour tap on one side equals the delay difference between the weakest tap and the identified neighbour tap on the other side.

- Select the neighbour tap that is weaker in power for merging.

- Otherwise, select the neighbour tap that has smaller delay difference for merging.

- To merge, the power of the merged tap is the linear sum of the power of the weakest tap and the selected tap.

- When the selected tap is the first tap, the location of the merged tap is the location of the first tap. The weakest tap is removed.

- When the selected tap is the last tap, the location of the merged tap is the location of the last tap. The weakest tap is removed.

- Otherwise, the location of the merged tap is based on the average delay of the weakest tap and selected tap. If the average delay is on the sampling grid, the location of the merged tap is the average delay. Merge two parallel taps with different delays (average delay, sum power) starting from the weakest ones. Otherwise, the location of the merged tap is rounded towards the direction of the selected tap (e.g. 10 ns & 20 ns 🡪 15 ns, 10 ns & 25 ns 🡪 20 ns, if 25 ns had higher or equal power; 15 ns, if 10 ns had higher power). The weakest tap and the selected tap are removed.

- Repeat step 6 until the final number of taps is 12.

Step 7: Round the amplitudes of taps to one decimal (e.g. -8.78 dB 🡪 -8.8 dB)

Step 8: If the delay spread has slightly changed due to the tap merge, adjust the final delay spread by increasing or decreasing the power of the last tap so that the delay spread is corrected.

Step 9: Re-normalize tap powers such that the strongest tap is at 0dB.

Note 1: Some values of the delay profile created by the simplification steps may differ from the values in tables B.2.1.1-2, B.2.1.1-3, B.2.1.1-4, B.2.1.2-2, and B.2.1.1-3 for the corresponding model.

Note 2: For Step 5 and Step 6, the power values are expressed in the linear domain using 6 digits of precision. The operations are in the linear domain.

Note 3: Delay profile for TDLD30 is generated under assumption that Steps 1-8 are applied for taps with Rayleigh distribution.

### B.2.1.1 Delay profiles for FR1

The delay profiles for FR1 are selected to be representative of low, medium and high delay spread environment. The resulting model parameters are specified in B.2.1.1-1 and the tapped delay line models are specified in Tables B.2.1.1-2 ~ Table B.2.1.1-5.

Table B.2.1.1-1: Delay profiles for NR channel models

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | Number of  channel taps | Delay spread  (r.m.s.) | Maximum excess tap delay (span) | Delay resolution |
| TDLA30 | 12 | 30 ns | 290 ns | 5 ns |
| TDLB100 | 12 | 100 ns | 480 ns | 5 ns |
| TDLC300 | 12 | 300 ns | 2595 ns | 5 ns |
| TDLD30 | 10 | 30 ns | 375 ns | 5 ns |

Table B.2.1.1-2: TDLA30 (DS = 30 ns)

|  |  |  |  |
| --- | --- | --- | --- |
| Tap # | Delay [ns] | Power [dB] | Fading distribution |
| 1 | 0 | -15.5 | Rayleigh |
| 2 | 10 | 0 | Rayleigh |
| 3 | 15 | -5.1 | Rayleigh |
| 4 | 20 | -5.1 | Rayleigh |
| 5 | 25 | -9.6 | Rayleigh |
| 6 | 50 | -8.2 | Rayleigh |
| 7 | 65 | -13.1 | Rayleigh |
| 8 | 75 | -11.5 | Rayleigh |
| 9 | 105 | -11.0 | Rayleigh |
| 10 | 135 | -16.2 | Rayleigh |
| 11 | 150 | -16.6 | Rayleigh |
| 12 | 290 | -26.2 | Rayleigh |

Table B.2.1.1-3: TDLB100 (DS = 100ns)

|  |  |  |  |
| --- | --- | --- | --- |
| Tap # | Delay [ns] | Power [dB] | Fading distribution |
| 1 | 0 | 0 | Rayleigh |
| 2 | 10 | -2.2 | Rayleigh |
| 3 | 20 | -0.6 | Rayleigh |
| 4 | 30 | -0.6 | Rayleigh |
| 5 | 35 | -0.3 | Rayleigh |
| 6 | 45 | -1.2 | Rayleigh |
| 7 | 55 | -5.9 | Rayleigh |
| 8 | 120 | -2.2 | Rayleigh |
| 9 | 170 | -0.8 | Rayleigh |
| 10 | 245 | -6.3 | Rayleigh |
| 11 | 330 | -7.5 | Rayleigh |
| 12 | 480 | -7.1 | Rayleigh |

Table B.2.1.1-4: TDLC300 (DS = 300 ns)

|  |  |  |  |
| --- | --- | --- | --- |
| Tap # | Delay [ns] | Power [dB] | Fading distribution |
| 1 | 0 | -6.9 | Rayleigh |
| 2 | 65 | 0 | Rayleigh |
| 3 | 70 | -7.7 | Rayleigh |
| 4 | 190 | -2.5 | Rayleigh |
| 5 | 195 | -2.4 | Rayleigh |
| 6 | 200 | -9.9 | Rayleigh |
| 7 | 240 | -8.0 | Rayleigh |
| 8 | 325 | -6.6 | Rayleigh |
| 9 | 520 | -7.1 | Rayleigh |
| 10 | 1045 | -13.0 | Rayleigh |
| 11 | 1510 | -14.2 | Rayleigh |
| 12 | 2595 | -16.0 | Rayleigh |

Table B.2.1.1-5: TDLD30 (DS = 30 ns)

|  |  |  |  |
| --- | --- | --- | --- |
| Tap # | Delay [ns] | Power [dB] | Fading distribution |
| 1 | 0 | -0.2 | LOS path |
| 0 | -12.4 | Rayleigh |
| 2 | 20 | -21 | Rayleigh |
| 3 | 40 | -16.7 | Rayleigh |
| 4 | 55 | -18.3 | Rayleigh |
| 5 | 80 | -21.9 | Rayleigh |
| 6 | 120 | -27.8 | Rayleigh |
| 7 | 240 | -23.6 | Rayleigh |
| 8 | 285 | -24.8 | Rayleigh |
| 9 | 290 | -30.0 | Rayleigh |
| 10 | 375 | -27.6 | Rayleigh |
| Note 1: Tap #1 follows a Ricean distribution. | | | |

### B.2.1.2 Delay profiles for FR2

The delay profiles for FR2 are specified in B.2.1.2-1 and the tapped delay line models are specified in Tables B.2.1.2-2 and B.2.1.2-3.

Table B.2.1.2-1: Delay profiles for NR channel models

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | Number of  channel taps | Delay spread  (r.m.s.) | Maximum excess tap delay (span) | Delay resolution |
| TDLA30 | 12 | 30 ns | 290 ns | 5 ns |
| TDLC60 | 12 | 60 ns | 520 ns | 5 ns |
| TDLD30 | 10 | 30 ns | 375 ns | 5 ns |

Table B.2.1.2-2: TDLA30 (DS = 30 ns)

|  |  |  |  |
| --- | --- | --- | --- |
| Tap # | Delay [ns] | Power [dB] | Fading distribution |
| 1 | 0 | -15.5 | Rayleigh |
| 2 | 10 | 0 | Rayleigh |
| 3 | 15 | -5.1 | Rayleigh |
| 4 | 20 | -5.1 | Rayleigh |
| 5 | 25 | -9.6 | Rayleigh |
| 6 | 50 | -8.2 | Rayleigh |
| 7 | 65 | -13.1 | Rayleigh |
| 8 | 75 | -11.5 | Rayleigh |
| 9 | 105 | -11.0 | Rayleigh |
| 10 | 135 | -16.2 | Rayleigh |
| 11 | 150 | -16.6 | Rayleigh |
| 12 | 290 | -26.2 | Rayleigh |

Table B.2.1.2-3: TDLC60 (DS = 60 ns)

|  |  |  |  |
| --- | --- | --- | --- |
| Tap # | Delay [ns] | Power [dB] | Fading distribution |
| 1 | 0 | -7.8 | Rayleigh |
| 2 | 15 | -0.3 | Rayleigh |
| 3 | 40 | 0 | Rayleigh |
| 4 | 50 | -8.9 | Rayleigh |
| 5 | 55 | -14.5 | Rayleigh |
| 6 | 75 | -8.5 | Rayleigh |
| 7 | 80 | -10.2 | Rayleigh |
| 8 | 130 | -12.1 | Rayleigh |
| 9 | 210 | -13.9 | Rayleigh |
| 10 | 300 | -15.2 | Rayleigh |
| 11 | 360 | -16.9 | Rayleigh |
| 12 | 520 | -19.4 | Rayleigh |

**Table B.2.1.2-4: TDLD30 (DS = 30 ns)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Tap #** | **Delay [ns]** | **Power [dB]** | **Fading distribution** |
| 1 | 0 | -0.2 | LOS path |
| 0 | -12.4 | Rayleigh |
| 2 | 20 | -21 | Rayleigh |
| 3 | 40 | -16.7 | Rayleigh |
| 4 | 55 | -18.3 | Rayleigh |
| 5 | 80 | -21.9 | Rayleigh |
| 6 | 120 | -27.8 | Rayleigh |
| 7 | 240 | -23.6 | Rayleigh |
| 8 | 285 | -24.8 | Rayleigh |
| 9 | 290 | -30.0 | Rayleigh |
| 10 | 375 | -27.6 | Rayleigh |
| Note 1: Tap #1 follows a Ricean distribution. | | | |

## B.2.2 Combinations of channel model parameters

The propagation conditions used for the performance measurements in multi-path fading environment are indicated as a combination of a channel model name and a maximum Doppler frequency, i.e., TDLA<DS>-<Doppler>, TDLB<DS>-<Doppler>, TDLC<DS>-<Doppler> or TDLD<DS>-<Doppler> where '<DS>' indicates the desired delay spread and '<Doppler>' indicates the maximum Doppler frequency (Hz).

Table B.2.2-1 and Table B.2.2-2 show the propagation conditions that are used for the performance measurements in multi-path fading environment for low, medium and high Doppler frequencies for FR1 and FR2, respectively.

**Table B.2.2-1: Channel model parameters for FR1**

|  |  |  |
| --- | --- | --- |
| **Combination name** | **Model** | **Maximum Doppler frequency** |
| TDLA30-5 | TDLA30 | 5 Hz |
| TDLA30-10 | TDLA30 | 10 Hz |
| TDLA30-180 | TDLA30 | 180 Hz |
| TDLA30-1400 | TDLA30 | 1400 Hz |
| TDLA30-2700 | TDLA30 | 2700 Hz |
| TDLB100-400 | TDLB100 | 400 Hz |
| TDLC300-100 | TDLC300 | 100 Hz |
| TDLC300-600 | TDLC300 | 600 Hz |
| TDLC300-1200 | TDLC300 | 1200 Hz |
| TDLD30-5 | TDLD30 | 5 Hz |

Table B.2.2-2: Channel model parameters for FR2

|  |  |  |
| --- | --- | --- |
| Combination name | Model | Maximum Doppler frequency |
| TDLA30-35 | TDLA30 | 35 Hz |
| TDLA30-75 | TDLA30 | 75 Hz |
| TDLA30-300 | TDLA30 | 300 Hz |
| TDLC60-300 | TDLC60 | 300 Hz |
| TDLD30-75 | TDLD30 | 75 Hz |

## B.2.3 MIMO Channel Correlation Matrices

The MIMO channel correlation matrices defined in B.2.3 apply for the antenna configuration using uniform linear arrays at both gNB and UE and for the antenna configuration using cross polarized antennas.

### B.2.3.1 MIMO Correlation Matrices using Uniform Linear Array (ULA)

The MIMO channel correlation matrices defined in B.2.3.1 apply for the antenna configuration using uniform linear array (ULA) at both gNB and UE.

#### B.2.3.1.1 Definition of MIMO Correlation Matrices

Table B.2.3.1.1-1 defines the correlation matrix for the gNB.

Table B.2.3.1.1-1: gNB correlation matrix

|  |  |  |  |
| --- | --- | --- | --- |
|  | One antenna | Two antennas | Four antennas |
| gNB Correlation |  |  |  |

Table B.2.3.1.1-2 defines the correlation matrix for the UE:

Table B.2.3.1.1-2 UE correlation matrix

|  |  |  |  |
| --- | --- | --- | --- |
|  | One antenna | Two antennas | Four antennas |
| UE Correlation |  |  |  |

Table B.2.3.1.1-3 defines the channel spatial correlation matrix. The parameters, *α* and *β* in Table B.2.3.1-3 defines the spatial correlation between the antennas at the gNB and UE.

Table B.2.3.1.1-3: correlation matrices

|  |  |
| --- | --- |
| 1x2 case |  |
| 1x4 case |  |
| 2x1 case |  |
| 2x2 case |  |
| 2x4 case |  |
| 4x1 case |  |
| 4x2 case |  |
| 4x4 case |  |

For cases with more antennas at either gNB or UE or both, the channel spatial correlation matrix can still be expressed as the Kronecker product of  and according to .

#### B.2.3.1.2 MIMO Correlation Matrices at High, Medium and Low Level

The *α* and *β* for different correlation types are given in Table B.2.3.1.2-1.

Table B.2.3.1.2-1: The *α* and *β* parameters for ULA MIMO correlation matrices

|  |  |  |
| --- | --- | --- |
| Correlation Model | *α* | *β* |
| Low correlation | 0 | 0 |
| Medium Correlation | 0.3 | 0.9 |
| Medium Correlation A | 0.3 | 0.3874 |
| High Correlation | 0.9 | 0.9 |

The correlation matrices for high, medium, medium A and low correlation are defined in Tables B.2.3.1.2-2, B.2.3.1.2-3, B.2.3.1.2-4 and B.2.3.1.2-5 as below.

The values in Table B.2.3.1.2-2 have been adjusted for the 4x2 and 4x4 high correlation cases to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:



Where the value "*a*" is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 4x2 high correlation case, *a*=0.00010. For the 4x4 high correlation case, *a*=0.00012.

The same method is used to adjust the 2x4 and 4x4 medium correlation matrix in Table B.2.3.1.2-3 to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision with *a* = 0.00010 and *a* = 0.00012.

Table B.2.3.1.2-2: MIMO correlation matrices for high correlation

|  |  |
| --- | --- |
| 1x2 case |  |
| 2x1 case |  |
| 2x2 case |  |
| 4x2 case |  |
| 4x4 case |  |

Table B.2.3.1.2-3: MIMO correlation matrices for medium correlation

|  |  |
| --- | --- |
| 1x2 case | N/A |
| 2x1 case | N/A |
| 2x2 case |  |
| **2x4 case** |  |
| 4x2 case |  |
| 4x4 case |  |

Table B.2.3.1.2-4: MIMO correlation matrices for medium correlation A

|  |  |
| --- | --- |
| 2x4 case |  |
| 4x4 case |  |

Table B.2.3.1.2-5: MIMO correlation matrices for low correlation

|  |  |
| --- | --- |
| 1x2 case |  |
| 1x4 case |  |
| 2x1 case |  |
| 2x2 case |  |
| 2x4 case |  |
| 4x1 case |  |
| 4x2 case |  |
| 4x4 case |  |

In Table B.2.3.1.2-5, **I**d is the *d*×*d* identity matrix.

### B.2.3.2 MIMO Correlation Matrices using Cross Polarized Antennas (X-pol)

The MIMO channel correlation matrices defined in B.2.3.2 apply for the antenna configuration using cross polarized (XP/X-pol) antennas at both gNB and UE. The cross-polarized antenna elements with +/-45 degrees polarization slant angles are deployed at gNB and cross-polarized antenna elements with +90/0 degrees polarization slant angles are deployed at UE.

For the 2D cross-polarized antenna array at eNodeB, the *N* antennas are indexed by , and total number of antennas is , where

-  is the number of antenna elements in first dimension with same polarization,

-  is the number of antenna elements in second dimension with same polarization, and

-  is the number of polarization groups.

For the 2D cross-polarized antennas at gNB, the *N* antennas are labelled such that antennas shall be in increasing order of the second dimension firstly, then the first dimension, and finally the polarization group. For a specific antenna element at *p*-th polarization, *n*1-th row, and *n*2-th column within the 2D antenna array, the following index number is used for antenna labelling:



where *N* is the number of transmit antennas, *p* is the polarization group index, *n*1 is the row index, and *n*2 is the column index of the antenna element.

For the linear (single dimension, 1D) cross-polarized antenna, the *N* antennas are labelled following the above equations with *N*2=1.

#### B.2.3.2.1 Definition of MIMO Correlation Matrices using cross polarized antennas

For the channel spatial correlation matrix, the following is used:



where

-  is the spatial correlation matrix at the UE with same polarization,

-  is the spatial correlation matrix at the gNB with same polarization,

- is a polarization correlation matrix, and

- denotes transpose.

The matrix is defined as:



A permutation matrix P elements are defined as:

.

where *Nt* and *Nr* is the number of transmitter and receiver respectively. This is used to map the spatial correlation coefficients in accordance with the antenna element labelling system described in B.2.3.2.

For the 2D cross-polarized antenna array at gNB, the spatial correlation matrix at the gNB is further expressed as following for 2D cross-polarized antenna array at gNB:



where

-  is the correlation matrix of antenna elements in first dimension with same polarization, and

-  is the correlation matrix of antenna elements in second dimension with same polarization.

For the 2D cross polarized antenna array at gNB side, the spatial correlation matrices in one direction of antenna array are as follows:

- For 1 antenna element with the same polarization in one direction,

.

- For 2 antenna elements with the same polarization in one direction,

.

- For 3 antenna elements with the same polarization in one direction,

.

- For 4 antenna elements with the same polarization in one direction,

.

where the index *i* = 1,2 stands for first dimension and second dimension respectively.

For the 1D cross-polarized antenna array at gNB, the matrix ofis determined by follow the equations for 2D cross-polarized antenna array and letting, i.e.



The spatial correlation matrices at UE side are as follows:

- For 1 antenna element with the same polarization,

.

- For 2 antenna elements with the same polarization,

.

#### B.2.3.2.2 MIMO Correlation Matrices using cross polarized antennas

The values for parameters *α*1, *α*2. *β* and *γ* for the cross polarized antenna models are given in Table B.2.3.2.2-1.

Table B.2.3.2.2-1: The *α* and *β* parameters for cross-polarized MIMO correlation matrices

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Correlation Model | *α*1 | *α*2 | *β* | ** |
| Medium Correlation | 0.3 | 0.3 | 0.6 | 0.2 |
| High Correlation | 0.9 | 0.9 | 0.9 | 0.3 |
| Note 1: Value of *α1* applies when more than one pair of cross-polarized antenna elements in first dimension at gNB side.  Note 2: Value of *α2* applies when more than one pair of cross-polarized antenna elements in second dimension at gNB side.  Note 3: Value of *β* applies when more than one pair of cross-polarized antenna elements at UE side. | | | | |

For the 1D cross polarized antenna array at gNB side, the correlation matrices for high spatial correlation and medium correlation are defined in Table B.2.3.2.2-2 and Table B.2.3.2.2-3 as below.

The values in Table B.2.3.2.2-2 have been adjusted to ensure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:

 or 

Where the value "*a*" is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 8(4,1,2)x2 high spatial correlation case, *a*=0.00010.

Table B.2.3.2.2-2: MIMO correlation matrices for high spatial correlation

|  |  |
| --- | --- |
| 4(2,1,2)x2 case |  |
| 2(1,1,2)x4 case |  |
| 4(2,1,2)x4 case |  |
| 8(4,1,2)x2 case |  |

Table B.2.3.2.2-3: MIMO correlation matrices for medium spatial correlation

|  |  |
| --- | --- |
| **2(1,1,2)x2 case** |  |

#### B.2.3.2.3 Beam steering approach

For the 2D cross-polarized antenna array at gNB, given the channel spatial correlation matrix in B.2.3.2.1 and B.2.3.2.2, the corresponding random channel matrix *H* can be calculated. The signal model for the *k*-th slot is denoted as:



And the steering matrix is further expressed as following:



Where:

- *H* is the *N­r*×*Nt* channel matrix per subcarrier.

-  is the steering matrix,

-  is the steering matrix in first dimension with same polarization,

-  is the steering matrix in second dimension with same polarization,

-  is the number of antenna elements in first dimension with same polarization,

-  is the number of antenna elements in second dimension with same polarization,

For antenna array with only one direction, number of antenna element in second direction equals 1.

For 1 antenna element with the same polarization in one direction,

.

For 2 antenna elements with the same polarization in one direction,

.

For 3 antenna elements with the same polarization in one direction,

.

For 4 antenna elements with the same polarization in one direction,

.

where the index  stands for first dimension and second dimension respectively.

 controls the phase variation in first dimension and second dimension respectively, and the phase for k-th subframe is denoted by, where is the random start value with the uniform distribution, i.e. ,  is the step of phase variation, which is defined in Table B.2.3.2.3-1, and k is the linear increment of 2-μ for every slot throughout the simulation, the index  stands for first dimension and second dimension respectively.

-  is the precoding matrix for Nt transmission antennas,

- *y* is the received signal, *x* is the transmitted signal, and *n* is AWGN.

-  corresponds to subcarrier spacing configuration, 

For the 1D cross-polarized antenna array at gNB, the corresponding random channel matrix *H* can be calculated by letting *N*2=1, i.e.



Table B.2.3.2.3-1: The step of phase variation

|  |  |
| --- | --- |
| Variation Step | Value (rad/ms) |
|  | 1.2566×10-3 |

#### B.2.3.2.3A Beam steering approach with dual cluster beams

For the 2D cross-polarized antenna array at gNB, given the channel spatial correlation matrix in B.2.3.2.1 and B.2.3.2.2, the corresponding random channel matrix *H* can be calculated. The signal model for the *k*-th slot is denoted as



And the steering matrix is further expressed as following:



where

- ,are independent channels for the first beam and second beam with the N­rxNtchannel matrix per subcarrier.

- , are the steering matrix for first beam and second beam

-  is the steering matrix in first dimension with same polarization,

-  is the steering matrix in second dimension with same polarization,

-  is the number of antenna elements in first dimension with same polarization,

-  is the number of antenna elements in second dimension with same polarization,

- For antenna array with only one direction, number of antenna element in second direction equals 1，

-  is the relative power ratio of the second beam to the first beam, the value of is specific to a test case,

For 1 antenna element of the same polarization in one direction, .

For 2 antenna elements of the same polarization in one direction, .

For 3 antenna elements of the same polarization in one direction,.

For 4 antenna elements of the same polarization in one direction, .

where the index  stands for first dimension and second dimension respectively.

-  controls the phase variation in first dimension and second dimension respectively, and the phase for k-th subframe is denoted by, where is the random start value with the uniform distribution, i.e., ,  is the step of phase variation, which is defined in Table B.2.3.2.3A-1, and k is the linear increment of 2-μ for every slot throughout the simulation, the index  stands for first dimension and second dimension respectively.

-  is the precoding matrix for Nt transmission antennas,

- *y* is the received signal, *x* is the transmitted signal, and *n* is AWGN.

-  corresponds to subcarrier spacing configuration, 

For the 1D cross-polarized antenna array at gNB, the corresponding random channel matrix *H* can be calculated by letting *N*2=1, i.e.,



Table B.2.3.2.3A-1: The step of phase variation

|  |  |
| --- | --- |
| Variation Step | Value (rad/subframe) |
|  | 1.2566×10-3 |
|  | 2.5132×10-3 |

## B.2.4 Two-tap propagation conditions for CQI tests

For Channel Quality Indication (CQI) tests, the following additional multi-path profile is used:



in continuous time representation, with  the delay, a constant value of *a* andthe Doppler frequency. The same *h*(*t*,*τ*) is used to describe the fading channel between every pair of Tx and Rx.

# B.3 High Speed Train Scenario

## B.3.1 Single Tap Channel Profile

The high speed train condition for the test of the baseband performance is a non-fading propagation channel with one tap. Doppler shift is given by

 (B.3.1.1)

where  is the Doppler shift and  is the maximum Doppler frequency. The cosine of angle is given by

,  (B.3.1.2)

,  (B.3.1.3)

,  (B.3.1.4)

where  is the initial distance of the train from gNB, and  is gNB Railway track distance, both in meters;  is the velocity of the train in m/s,  is time in seconds.

Doppler shift and cosine angle are given by equation B.3.1.1 and B.3.1.2-B.3.1.4 respectively, where the required input parameters listed in table B.3.1-1 and the resulting Doppler shift shown in Figures B.3.1-1, B.3.1-2, B.3.1-3, B.3.1-4 are applied for all frequency bands.

Table B.3.1-1: High speed train scenario

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Value | | | |
| HST-750 | HST-972 | HST-1000 | HST-1667 |
|  | 300 m | 300 m | 300 m | 300 m |
|  | 2 m | 2 m | 2 m | 2 m |
|  | 300 km/h | 500 km/h | 300 km/h | 500 km/h |
|  | 750 Hz for 15 kHz SCS test | 972 Hz for 15 kHz SCS test | 1000 Hz for 30 kHz SCS test | 1667 Hz for 30 kHz SCS test |

Note 1: Parameters for HST conditions in table B.3.1-1 including  and Doppler shift trajectories presented on figures B.3.1-1 for 750 Hz and B.3.1-3 for 972 Hz for 15 kHz SCS and figures B.3.1-2 for 1000 Hz and B.3.1-4 for 1667 Hz for 30 kHz SCS are applied for performance verification in all frequency bands.

Note 2: The propagation conditions used for the performance requirements under high speed train condition are indicated as a combination of “HST” and Doppler shift, i.e. HST-<Doppler shift>, where ‘<Doppler shift>‘indicates the maximum Doppler shift (Hz).

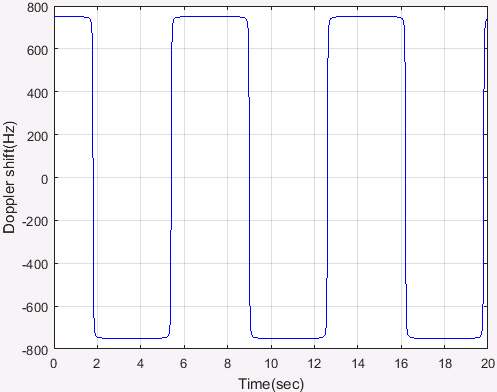


Figure B.3.1-1: Doppler shift trajectory (= 750 Hz)

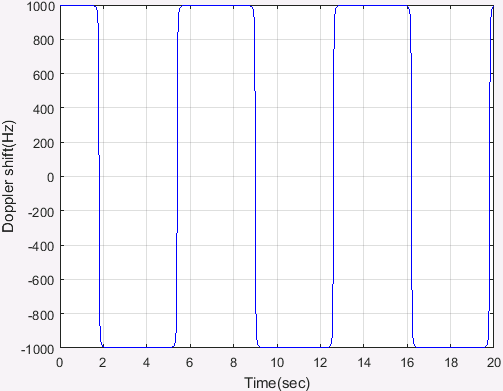


Figure B.3.1-2: Doppler shift trajectory (= 1000 Hz)



Figure B.3.1-3: Doppler shift trajectory (= 972 Hz)



Figure B.3.1-4: Doppler shift trajectory (= 1667 Hz)

For 1x2 antenna configuration, the same *h*(*t*,*τ*) is used to describe the channel between every pair of Tx and Rx.

For 1x4 antenna configuration, the same *h*(*t*,*τ*) is used to describe the channel between every pair of Tx and Rx.

## B.3.2 HST-SFN Channel Profile

There is an infinite number of RRHs distributed equidistantly along the track with the same Cell ID as depicted in figure B.3.2-1.



Figure B.3.2-1: Deployment of HST-SFN

The location of RRH *k* is given as:

 (B.3.2.1)

where: ,  and is the distance between the RRHs and railway track, while  is the distance of two RRHs, both in meters.

The train location is denoted as:

 (B.3.2.2)

where:  and *a* means distance in meters, which means the train is right on the track.

The HST-SFN scenario for the test of the baseband performance is a non-fading propagation channel with four taps, namely the four nearest RRHs. RRH *k* is visible for the train only in the range:

 (B.3.2.3)

Power level  (dB) for the signal from *k*th RRH, normalized to the total power received from all visible RRHs, is given by:

 for  (B.3.2.4)

Doppler shift (Hz) from *k*th RRH is given by:

(B.3.2.5)

The relative delay  (s) for the signal from *k*th RRH can be derived as:

 for  (B.3.2.6)

In the above, *f*d (Hz) is the maximum Doppler frequency as given in Table B.3.2-1, and *C* (m/s) is the velocity of light.

Power level, Doppler shift and relative delay are given by equations B.3.2.4 ~ B.3.2.6 respectively, where the required input parameters listed in table B.3.2-1 and the resulting Doppler shift shown in Figures B.3.2-3 and B.3.2-4 are applied for all frequency bands.

Table B.3.2-1: HST-SFN scenario

|  |  |
| --- | --- |
| Parameter | Value |
|  | 700 m |
|  | 150 m |
|  | 500 km/h |
|  | 870 Hz for 15 kHz SCS test;  1667 Hz for 30 kHz SCS test |

NOTE 1: The trajectories of relative power, Doppler shifts and absolute delays presented in Figures B.3.2-2, B.3.2-3, B.3.2-4 and B.3.2-5 are derived from the equations B.3.2.4 ~ B.3.2.6 respectively. v is the velocity of the train.

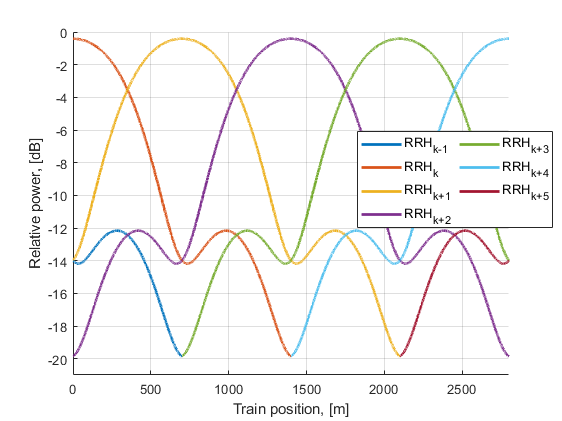


Figure B.3.2-2 Relative power level trajectories

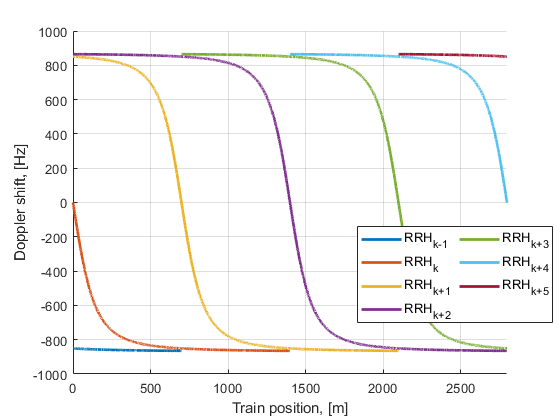


Figure B.3.2-3 Doppler shift trajectories (= 870 Hz)

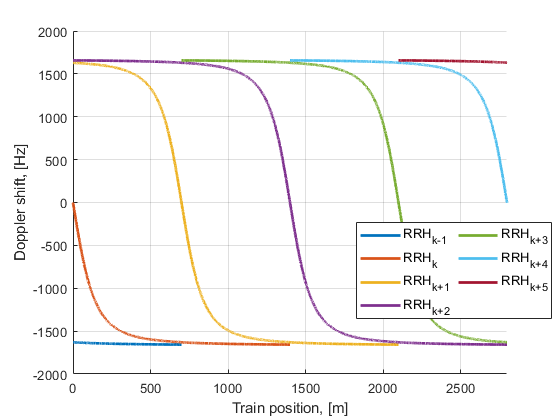


Figure B.3.2-4 Doppler shift trajectories (= 1667 Hz)

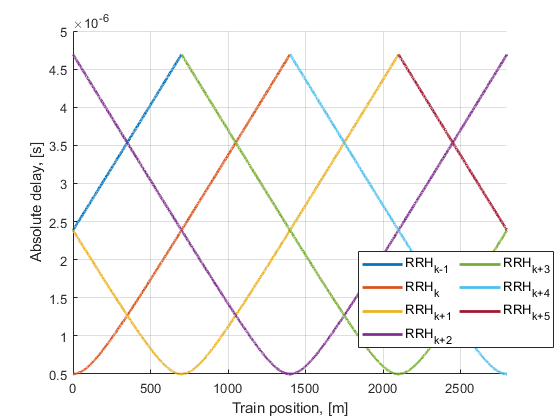


Figure B.3.2-5 Absolute delay trajectories

Static channel matrix will be used as defined in Annex B.1.

## B.3.3 HST-DPS Channel Profile

There is an infinite number of RRHs distributed equidistantly along the railway track with the same Cell ID as illustrated in Figure B.3.3-1.



Figure B.3.3-1: Deployment of HST-DPS

The location of RRH *k* is given as:

 (B.3.3.1)

where: ,  and is the distance between the RRHs and railway track, while  is the distance of two RRHs, both in meters.

The train location is denoted as:

 (B.3.3.2)

where:  and *a* means distance in meters, which means the train is right on the track.

The HST DPS multi-RRH scenario for the test of the baseband performance is a single tap propagation channel at each time with switching of transmission point in the middle point between two RRHs. As shown in figures B.3.3-2 and B3.3-4. RRH *k* is visible for the train only in the range:

(B.3.3.3)

However, as shown in Figures B.3.3-3 and B.3.3-5, RRH k is considered for PDSCH and PDCCH signal transmission only in the range:

 (B.3.3.4)

Propagation delay difference are not considered between signals from different RRHs.

Power level  (dB) for the signal from each RRH equals to 0. Doppler shift (Hz) from *k*th RRH is given by:

(B.3.3.5)

In the above, fd (Hz) is the maximum Doppler frequency as given in Table B.3.3-1, and C (m/s) is the velocity of light.

Doppler shift is given by equation B.3.3.5, where the required input parameters listed in table B.3.3-1 and the resulting Doppler shift shown in Figures B.3.3-2 ~ B.3.3-5 are applied for all frequency bands.

Table B.3.3-1: HST-DPS scenario

|  |  |
| --- | --- |
| Parameter | Value |
|  | 700 m |
|  | 150 m |
|  | 500 km/h |
|  | 870 Hz for 15 kHz SCS test;  1667 Hz for 30 kHz SCS test |

NOTE 1: *v* is the velocity of the train.



Figure B.3.3-2 Doppler shift trajectory (

= 870 Hz) showing visibility of each RRH



Figure B.3.3-3 Doppler shift trajectory (= 870 Hz) as seen by PDCCH and PDSCH for each RRH



Figure B.3.3-4 Doppler shift trajectory (

= 1667 Hz) showing visibility of each RRH



Figure B.3.3-5 Doppler shift trajectory (

= 1667 Hz) as seen by PDCCH and PDSCH for each RRH

Static channel matrix will be used as defined in Annex B.1.

## B.3.4 FFS

## B.3.5 HST-SFN Scheme A Channel Profile

There is an infinite number of RRHs distributed equidistantly along the railway track with the same Cell ID as illustrated in Figure B.3.5-1. The PDCCH/PDSCH are transmitted in SFN manner and TRS are transmitted in TRP specific manner as illustrated in Figure B.3.5-1.

Graphical user interface, application

Description automatically generated

Figure B.3.5-1: Deployment of HST-SFN Scheme A

The location of RRH *k* is given as:

(B.3.5.1)

where: ,  and *Dmin* is the distance between the RRHs and railway track, while *Ds* is the distance of two RRHs, both in meters.

The train location is denoted as:

(B.3.5.2)

where:  and *a* means distance in meters, which means the train is right on the track.

The HST Scheme A scenario for the test of the baseband performance is a non-fading propagation channel with two taps, namely the two nearest RRHs. Thus, RRH *k* is visible for the train only in the range:

(B.3.5.3)

Power level *Pk* (dB) for the signal from *k*th RRH, normalized to the total power received from all visible RRHs, is given by:

for (B.3.5.4)

Doppler shift (Hz) from *k*th RRH for TRSk, PDCCH, PDSCH as shown in figure B.3.5-1 is given by:

(B.3.5.5)

The relative delay *Tk* (s) for the signal from *k*th RRH can be derived as:

(B.3.5.6)

In the above *v* (m/s) is the moving speed of the train, *f*C (Hz) is the centre frequency, and *C* (m/s) is the velocity of light.

Power level, Doppler shift and relative delay are given by equations B.3.5.4 ~ B.3.5.6 respectively, where the required input parameters listed in table B.3.5-1 and the resulting Doppler shift shown in Figures B.3.5-3 and B.3.5-4 are applied for all frequency bands.

Table B.3.5-1: HST-SFN scenario

|  |  |
| --- | --- |
| Parameter | Value |
|  | 700 m |
|  | 150 m |
|  | 500 km/h |
|  | 870 Hz for 15 kHz SCS test;  1667 Hz for 30 kHz SCS test |

NOTE 1: Equation B.3.5.5 is a general formula for Doppler shift calculation. When defining the requirement for FR1 HST, max Doppler shifts fd which corresponds to fc\*v/C in equation B.3.5.5 are selected as defined in Table B.3.5-1 for HST-SFN Scheme A scenario.



Figure B.3.5-2: Relative power level trajectories



Figure B.3.5-3: Doppler shift trajectory (*fd*= 870 Hz) showing visibility of each RRH



Figure B.3.5-4: Doppler shift trajectory (= 1667 Hz) showing visibility of each RRH



Figure B.3.5-5: Absolute delay trajectories

Static channel matrix will be used as defined in Annex B.1.

## B.3.6 HST-SFN Scheme B Channel Profile

There is an infinite number of RRHs distributed equidistantly along the track with the same Cell ID as depicted in figure B.3.6-1. The PDCCH/PDSCH are transmitted in SFN manner from two RRHs and TRS are transmitted in RRH specific manner as illustrated in Figure B.3.6-1.

Graphical user interface, application

Description automatically generated

Figure B.3.6-1: Deployment of HST-SFN Scheme B

The location of RRH *k* is given as:

(B.3.6.1)

where:, and *Dmin* is the distance between the RRHs and railway track, while *Ds* is the distance of two RRHs, both in meters.

The train location is denoted as:

(B.3.6.2)

where: and *a* means distance in meters, which means the train is right on the track.

The HST-SFN Scheme B scenario for the test of the baseband performance is a non-fading propagation channel with two taps, namely the two nearest RRHs. Thus, RRH *k* is visible for the train only in the range:

(B.3.6.3)

Power level *Pk* (dB) for the signal from *k*th RRH, normalized to the total power received from all visible RRHs, is given by:

(B.3.6.4)

Doppler shift *FD,k* (Hz) from *k*th RRH for TRSk, PDCCH and PDSCH transmission and Doppler shift *FD,k+1* (Hz) from (*k+1)*th RRH for PDCCH and PDSCH transmission as illustrated in Figure B.3.6-1 is given by:

for (B.3.6.5)

The relative delay *Tk* (s) for the signal from *k*th RRH can be derived as:

(B.3.6.6)

In the above *v* (m/s) is the moving speed of the train, *f*C (Hz) is the centre frequency, and *C* (m/s) is the velocity of light.

Power level, Doppler shift and relative delay are given by equations B.3.6.4 ~ B.3.6.6 respectively, where the required input parameters listed in table B.3.6-1 and the resulting Doppler shift shown in Figures B.3.6-3 and B.3.6-4 are applied for all frequency bands.

**Table B.3.6-1: HST-SFN Scheme B scenario**

|  |  |
| --- | --- |
| Parameter | Value |
| HST-SFN-SchemeB |
| Ds | 700 m |
| Dmin | 150 m |
| v | 500 km/h |
| fd | 870 Hz for 15 kHz SCS test;  1667 Hz for 30 kHz SCS test |

NOTE 1: The trajectories of relative power, Doppler shifts and absolute delays presented in Figures B.3.6-2, B.3.6-3, B.3.6-4 and B.3.6-5 are derived from the equations B.3.6.4 ~ B.3.6.6 respectively.

NOTE 2: Equation B.3.6.5 is a general formula for Doppler shift calculation. When defining the requirement for FR1 HST, max Doppler shifts fd which corresponds to fc\*v/C in equation B.3.6.5 are selected as defined in Table B.3.6-1 for HST-SFN scenario.

Chart, line chart

Description automatically generated

Figure B.3.6-2: Relative power level trajectories

Chart

Description automatically generated

Figure B.3.6-3: Doppler shift trajectories (*fd* = 870 Hz)

Chart

Description automatically generated

Figure B.3.6-4: Doppler shift trajectories (*fd* = 1667 Hz)

Chart, line chart

Description automatically generated

Figure B.3.6-5: Absolute delay trajectories

Static channel matrix will be used as defined in Annex B.1.

# B.4 Physical signals, channels mapping and precoding

## B.4.1 General

Unless otherwise stated, the transmission on antenna port(s) is defined by using a precoder matrix  of size , where is the number of physical transmit antenna elements configured per test , is the number of ports for a reference signal or physical channel configured per test, and is the first port for that reference signal or physical channel as defined in clauses 7.3 and 7.4 in TS 38.211 [9]. This precoder takes as an input a block of signals for antenna port(s) , , , with  being the number of modulation symbols per antenna port including the reference signal symbols, and generates a block of signals the elements of which are to be mapped onto the frequency-time index pair as per the test configuration but transmitted on different physical antenna elements:

For Clause 6 and 8, the transmission of PDCCH and PDCCH DMRS on antenna port is defined by using a precoder matrix  of size 2x1. This precoder takes as an input a block of signals for antenna port(s) , and generates a block of signals the elements of which are to be mapped onto the frequency-time index pair as per the test configuration but transmitted on different physical antenna elements:

The precoder matrix is specific to the test case configuration  is defined in Clause 5.2.2.2 of TS 38.214 [12].

The transmission on PT-RS antenna port is associated (using same precoder) with the lowest indexed DM-RS antenna port among the DM-RS antenna ports assigned for the PDSCH.

The physical antenna elements are identified by indices, where  is the number of physical antenna elements configured per test.

Modulation symbols with (i.e. PSS, SSS, PBCH and DM-RS for PBCH) are directly mapped to first physical antenna element.

Modulation symbols  for CSI-RS resources which configured for tracking with one port are directly mapped to first physical antenna element.

Modulation symbols  for CSI-RS resources which configured for beam refinement with one port are directly mapped to first physical antenna element.

Modulation symbols  for NZP CSI-RS which configured for CSI acquisition with  are mapped to the physical antenna index  where is the number of NZP CSI-RS ports configured per test.

## B.4.2 Beamforming for MU-MIMO

The transmission on antenna port(s) , with being the number of co-scheduled UEs allocated for different antenna ports in one RE is defined by using a precoder matrix of size , where is the number of physical transmit antenna elements configured per test , is the number of ports for UE *n* for a reference signal or physical channel configured per test, is the precoder matrix for UE *n* which isspecific to the test case configuration, and is the first port for UE *n* for that reference signal or physical channel as defined in clauses 7.3 and 7.4 in TS 38.211 [9]. This precoder takes as an input a block of signals for antenna port(s) , , , with being the number of modulation symbols per antenna port including the reference signal symbols, and generates a block of signals the elements of which are to be mapped onto the frequency-time index pair as per the test configuration but transmitted on different physical antenna elements:

The is specific to test case configuration and defined to maintain the average per UE signal power as

# B.5 Downlink Transmission Model for requirements on bands with shared spectrum access

This clause provides a description of the Downlink Transmission Model to be used in PDSCH Demodulation and CQI reporting performance tests on bands with shared spectrum access.

The model as designed in the following applies to both configurations for *channelAccessMode*=’semiStatic’ or ‘dynamic’.

## B.5.1 Downlink Transmission Model for bands with shared spectrum access

The Downlink Period for performance tests on bands with shared spectrum access is defined as the duration included in the Test Configuration Parameters.

For tests configured with the RRC Parameter *channelAccessMode*=’semiStatic’, the duration of the Fixed Frame Period (FFP) equals the duration of the Downlink Period.

For each Downlink Period, the downlink signal to be transmitted is allocated according to the steps listed below:

1. Select the Downlink Transmission Duration in number of slots, randomly and with equally distributed probability, from the set of possible Downlink Transmission Duration values as included in the Test Configuration Parameters;

a. This duration includes occupied OFDM symbols and non-occupied OFDM symbols within the Downlink Transmission;

2. Depending on the Downlink Transmission Duration chosen in the previous step:

b. If the Downlink Transmission Duration equals 2 slots, all the OFDM symbols in both slots are fully allocated to downlink transmission, else;

c. If the Downlink Transmission Duration is larger than 2 slots, the configuration of occupied symbols in the last slot included in the downlink duration is selected in number of symbols, randomly and with equally distributed probability, from the set of possible ‘Occupied OFDM symbols in the last slot of the downlink duration’ as included in the Test Configuration Parameters;

For each Downlink Period, the last Slot is not scheduled for downlink transmission. This is to comply with the Idle period requirement in case of *channelAccessMode*=’semiStatic’, and to align the test setup. In the case of *channelAccessMode*=’semiStatic’, it can be assumed that the Channel Occupancy Time (COT) covers the entire duration of the Downlink Period except for the last slot.

For each Downlink Period, a uniform random variable from [0, 1] is generated. If the random variable is less than the *pLBT* value included in the Test Configuration Parameters, the entire Downlink Period duration is muted across the entire bandwidth. This applies to all the signals that were scheduled for transmission, including but not limited to PDSCH, PDCCH, SSB, TRS, CSI-RS, etc.

# B.6 Interference model for PDSCH requirements with intercell interference

## B.6.1 Interference to Noise ratio (INR)

Each interfering cell involved in PDSCH performance requirements with intercell interference is characterized by its associated interferer to noise ratio (INR) value:

where is the average received power spectral density from the i-th strongest interfering cell involved in the requirement scenario on the j-th antenna connector and is the average power spectral density of a white noise source consistent with definition provided in section [4.4.3/4.5.3].

## B.6.2 Interference model for PDSCH requirements

This subclause provides synchronous network deployment interference model for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit 16 QAM based randomly modulated data over the entire PDSCH region and over the full transmission bandwidth of the specified reference measurement channel. Transmitted physical channels shall include SSB and TRS/CSI-RS as specified in requirements section.

Transmission rank of the interfering cell shall be randomly determined with probabilities as specified in the requirements. The rank configuration will be independent for each interfering cell

For each slot a single precoding matrix for the number of layers υ associated to the selected rank shall be selected randomly from Table 5.2.2.2.1-1 of TS 38.214 [12] with PRB bundling size as given in the requirements.

The generic beamforming model in subclause B.4.1 shall be applied assuming number of antenna ports as specified in the requirement scenario.

Random precoding with selected rank and precoding matrices for each slot shall be applied to 16 QAM randomly modulated layer symbols including the demodulation reference symbols over antenna port 1000 when the rank is one and antenna ports 1000, 1001 when the rank is two. DMRS type 1 with front loaded single symbol and one additional DMRS position with FDM applied between DMRS and data (number of CDM groups without data is 1)

For REs in the control region, random precoding for the number of Tx antenna ports in the requirement scenario shall be applied to QPSK randomly modulated symbols. The EPRE ratio of these REs shall be as defined for PDCCH in Annex C.3.1

# B.7 Interference model for PDSCH requirements with LTE-NR spectrum sharing

This clause provides interference modelling for each explicitly modelled LTE interfering cell. Each interfering cell involved in PDSCH performance requirements for LTE-NR spectrum sharing is characterized by its associated interferer to noise ratio (INR) value as defined in B.6.1.

In each subframe, each interfering cell shall transmit 16QAM randomly modulated data over the entire PDSCH region and over the full t7ransmission bandwidth according to the probabilities of occurrence. Transmitted physical channels shall include PSS, SSS and PBCH. Probabilities of occurrence of LTE PDSCH in each subframe are as specified in requirements.

For each subframe, a transmission rank shall be randomly determined independently from interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in requirements.

For each subframe, a precoding matrix for the number of layers  associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of TS 36.211 [15]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is .

Precoding for spatial multiplexing with CRS for the number of antenna ports shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.2.1 of TS 36.211 [15] with the selected precoding matrices for each subframe.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the simulation scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of TS 36.211 [15]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2 of TS 36.101 [4].

Annex C (normative):   
Downlink physical channels

# C.0 Downlink signal levels

Downlink power settings to be configured for connection setup has been defined in this clause covering both FR1 and FR2.

## C.0.1 FR1 Downlink Signal Levels (Conducted)

The downlink power settings in Table C.0.1-1 is used for FR1 conducted unless otherwise specified in a test case.

If the UE has more than one Rx antenna, the downlink signal is applied to each one. All UE Rx antennas shall be connected.

Table C.0.1-1: Default Downlink power levels for NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SCS (kHz) |  | Unit | Channel bandwidth | | | | | | | | | | | |
|  |  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| 15 | Number of RBs |  | 25 | 50 | 75 | 100 | 128 | 160 | 215 | 270 | N/A | N/A | N/A | N/A |
| Channel BW power | dBm | -60 | -57 | -55 | -54 | -53 | -52 | -51 | -50 | N/A | N/A | N/A | N/A |
| 30 | Number of RBs |  | 10 | 24 | 36 | 50 | 64 | 75 | 100 | 128 | 162 | 216 | 243 | 270 |
| Channel BW power | dBm | -61 | -57 | -55 | -54 | -53 | -52 | -51 | -50 | -49 | -48 | -47 | -47 |
| 60 | Number of RBs |  | N/A | 10 | 18 | 24 | 30 | 36 | 50 | 64 | 75 | 100 | 120 | 135 |
| Channel BW power | dBm | N/A | -58 | -56 | -54 | -53 | -52 | -51 | -50 | -49 | -48 | -47 | -47 |
|  | SSS EPRE | dBm/ 15 kHz | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 |
|  | NOTE 1: The channel bandwidth powers are informative, based on -85dBm/15kHz SS/PBCH SSS EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed.  NOTE 2: The power level is specified at each UE Rx antenna.  NOTE 3: DL level is applied for any of the Subcarrier Spacing configuration ( ) with the same power spectrum density of -85 dBm/15 kHz. | | | | | | | | | | | | | |

The default signal level uncertainty is [+/-3] dB at each test port, for any level specified. If the uncertainty value is critical for the test purpose, a tighter uncertainty is specified for the related test case in [Annex F]

## C.0.2 FR2 Downlink Signal Levels (Radiated)

The downlink power settings in Table C.0.2-1 is used unless otherwise specified in a test case.

Table C.0.2-1: Default Downlink power levels for NR FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| SCS  (kHz) |  | Unit | Channel Bandwidth | | | |
| 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| 60 | Number of RBs |  | 66 | 132 | 264 | N/A |
| Channel BW power | dBm | -70 | -67 | -64 | N/A |
| 120 | Number of RBs |  | 32 | 66 | 132 | 264 |
| Channel BW power | dBm | -70 | -67 | -64 | -61 |
|  | SS/PBCH SSS EPRE | dBm/60 kHz | [-99] | [-99] | [-99] | [-99] |
| NOTE 1: The channel bandwidth powers are informative, based on [-99] dBm/60 kHz SS/PBCH SSS EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed.  NOTE 2: The power level is specified at the centre of quiet zone.  NOTE 3: DL level is applied for any of the Subcarrier Spacing configuration () with the same power spectrum density of [-99]dBm/60kHz. | | | | | | |

The default downlink signal level uncertainty is +/- TBD dB, for any level specified. If the uncertainty value is critical for the test purpose, a tighter uncertainty is specified for the related test case in Annex F.

# C.1 Setup

The following clause describes the downlink Physical Channels that are transmitted during connection setup.

## C.1.1 FR1 Setup

Table C.1.1-1 describes the downlink Physical Channels that are required for FR1 connection set up.

Table C.1.1-1: Downlink Physical Channels required for FR1 connection setup

|  |
| --- |
| Physical Channel |
| PBCH |
| SSS |
| PSS |
| PDCCH |
| PDSCH |
| PBCH DMRS |
| PDCCH DMRS |
| PDSCH DMRS |
| CSI-RS |

The following common PDSCH and PDCCH configuration parameters shall be used to bring up the connection setup for FR1 NR cell.

Table C.1.1-2: Common reference channel parameters for FR1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| CORESET frequency domain allocation |  | Full BW,number of RB’s to be in multiple of 6 |
| CORESET time domain allocation |  | 2 OFDM symbols at the begin of each slot |
| PDSCH mapping type |  | Type A |
| PDSCH start symbol index (S) |  | 2 |
| Number of consecutive PDSCH symbols (L) |  | 12 |
| PDSCH PRB bundling | PRBs | 2 |
| Dynamic PRB bundling |  | false |
| Overhead value for TBS determination |  | 0 |
| First DMRS position for Type A PDSCH mapping |  | 2 |
| DMRS type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| FDM between DMRS and PDSCH |  | Enable |
| TRS configuration |  | 2 slots, periodicity 20 ms, offset 10 |
| PTRS configuration |  | PTRS is not configured |
| Num of HARQ processes |  | 8 (TDD) |
| Aggregation level | CCE | 4 |

Table C.1.1-3: Additional reference channels parameters for FDD

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Number of HARQ Processes |  | 4 |
| K1 value |  | 2 for all slots |

Table C.1.1-4: TDD UL-DL pattern for SCS 15 KHz

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | UL-DL pattern |
| FR1.15-1 |
| TDD Slot Configuration pattern (Note 1) | |  | DDDSU |
| Special Slot Configuration (Note 2) | |  | 10D+2G+2U |
| UL-DL configuration (*tdd-UL-DL-ConfigurationCommon*) | *referenceSubcarrierSpacing* | kHz | 15 |
| *dl-UL-TransmissionPeriodicity* | ms | 5 |
| *nrofDownlinkSlots* |  | 3 |
| *nrofDownlinkSymbols* |  | 10 |
| *nrofUplinkSlot* |  | 1 |
| *nrofUplinkSymbols* |  | 2 |
| K1 value  (PDSCH-to-HARQ-timing-indicator) | |  | [4] if mod(I,5) = 0 [3] if mod(i,5) = 1 [2] if mod(i,5) = 2 [6] if mod(i,5) = 3 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index per frame; i = {0,…,9} | | | |

Table C.1.1-5: TDD UL-DL pattern for SCS 30 KHz

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | UL-DL Pattern |
| TDD Slot Configuration pattern (Note 1) | |  | 7DS2U |
| Special Slot Configuration (Note 2) | |  | 6D+4G+4U |
| UL-DL configuration (*tdd-UL-DL-ConfigurationCommon*) | *referenceSubcarrierSpacing* | 30 | kHz |
| *dl-UL-TransmissionPeriodicity* | 5 |  |
| *nrofDownlinkSlots* | 7 |  |
| *nrofDownlinkSymbols* | 6 |  |
| *nrofUplinkSlot* | 2 |  |
| *nrofUplinkSymbols* | 4 |  |
| UL-DL configuration2 (*tdd-UL-DL-ConfigurationCommon2*) | *referenceSubcarrierSpacing* | N/A |  |
| *dl-UL-TransmissionPeriodicity* | N/A |  |
| *nrofDownlinkSlots* | N/A |  |
| *nrofDownlinkSymbols* | N/A |  |
| *nrofUplinkSlot* | N/A |  |
| *nrofUplinkSymbols* | N/A |  |
| K1 value  (PDSCH-to-HARQ-timing-indicator) | |  | 8 if mod(i,10) = 0 7 if mod(i,10) = 1 6 if mod(i,10) = 2 5 if mod(i,10) = 3 5 if mod(i,10) = 4 4 if mod(i,10) = 5 3 if mod(i,10) = 6 2 if mod(i,10) = 7 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index per frame; i = {0,…,19} | | | |

Table C.1.1-6: PDCCH Aggregation level for NR-LTE coexistence test cases

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Aggregation level | CCE | 2 |

## C.1.2 FR2 Setup

Table C.1.2-1 describes the downlink Physical Channels that are required for FR2 connection set up.

Table C.1.2-1: Downlink Physical Channels required for FR2 connection set-up

|  |
| --- |
| Physical Channel |
| PBCH |
| SSS |
| PSS |
| PDCCH |
| PDSCH |
| PBCH DMRS |
| PDCCH DMRS |
| PDSCH DMRS |
| CSI-RS |
| PTRS |

The following common PDSCH and PDCCH configuration parameters shall be used to bring up the connection setup for FR2 NR cell.

Table C.1.2-2: Common reference channel parameters for FR2

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| CORESET frequency domain allocation |  | Full BW, number of RB’s to be in multiple of 6 |
| CORESET time domain allocation |  | 1 OFDM symbols at the begin of each slot |
| PDSCH mapping type |  | Type A |
| PDSCH start symbol index (S) |  | 1 |
| Number of consecutive PDSCH symbols (L) |  | 13 |
| PDSCH PRB bundling | PRBs | 2 |
| Dynamic PRB bundling |  | false |
| MCS table for TBS determination |  | 64QAM |
| Overhead value for TBS determination |  | 0 |
| First DMRS position for Type A PDSCH mapping |  | 2 |
| DMRS type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| FDM between DMRS and PDSCH |  | Enable |
| TRS configuration |  | 2 slots, periodicity 20 ms, offset 10 |
| PTRS configuration |  | Single port, every other RB, every symbol (K=2, L=1) |
| Num of HARQ processes |  | 8 |

Table C.1.2-3: Additional test parameters for TDD for SCS 60 KHz

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | UL-DL pattern |
| TDD Slot Configuration pattern (Note 1) | |  | DDSU |
| Special Slot Configuration (Note 2) | |  | 11D+3G+0U |
| UL-DL configuration (*tdd-UL-DL-ConfigurationCommon*) | *referenceSubcarrierSpacing* | kHz | 60 |
| *dl-UL-TransmissionPeriodicity* | ms | 1 |
| *nrofDownlinkSlots* |  | 2 |
| *nrofDownlinkSymbols* |  | 11 |
| *nrofUplinkSlot* |  | 1 |
| *nrofUplinkSymbols* |  | 0 |
| K1 value  (PDSCH-to-HARQ-timing-indicator) | |  | K1 = 3 if mod(i,4) = 0 K1 = 2 if mod(i,4) = 1 K1 = 5 if mod(i,4) = 2 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index per frame; i = {0,…,39} | | | |

Table C.1.2-4: Additional test parameters for TDD for SCS 120 KHz

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | UL-DL pattern |
| TDD Slot Configuration pattern (Note 1) | |  | DDDSU |
| Special Slot Configuration (Note 2) | |  | 10D+2G+2U |
| UL-DL configuration (*tdd-UL-DL-ConfigurationCommon*) | *referenceSubcarrierSpacing* | kHz | 120 |
| *dl-UL-TransmissionPeriodicity* | ms | 0.625 |
| *nrofDownlinkSlots* |  | 3 |
| *nrofDownlinkSymbols* |  | 10 |
| *nrofUplinkSlot* |  | 1 |
| *nrofUplinkSymbols* |  | 2 |
| K1 value  (PDSCH-to-HARQ-timing-indicator) | |  | K1 = [4] if mod(i,5) = 0 K1 = [3] if mod(i,5) = 1 K1 = [2] if mod(i,5) = 2 K1 = [6] if mod(i,5) = 3 |
| Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.  Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information.  Note 3: i is the slot index per frame; i = {0,…,79} | | | |

# C.2 Connection

## C.2.1 FR1 Measurement of Performance Characteristics

Unless otherwise stated, Table C.2.1-1 is applicable for measurements in which uniform RS-to-EPRE boosting for all downlink physical channels is used.

Table C.2.1-1: Downlink Physical Channels transmitted during a connection (FDD and TDD) for FR1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value (NOTE 2) |
| SSS transmit power | W | Test specific |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH to SSS | dB | 0 |
| EPRE ratio of PBCH to PBCH DMRS | dB | 0 |
| EPRE ratio of PDCCH to SSS | dB | 0 |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 |
| EPRE ratio of PDSCH to SSS | dB | 0 |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | Test specific (Note 1) |
| EPRE ratio of NZP CSI-RS to SSS | dB | -10\*log10(L) (Note 3) |
| EPRE ratio of PDSCH OCNG to SSS | dB | 0 |
| EPRE ratio of PDCCH OCNG to SSS | dB | 0 |
| EPRE ratio of LTE CRS to NR SSS | dB | 0 (Note 4) |
| NOTE 1: Value is derived from Table 4.1-1 in TS 38.214 [X] based on “Number of DM-RS CDM groups without data” and “DMRS Type” parameters specified for each test.  NOTE 2: The value is the energy of per RE for a single antenna port before pre-coding.  NOTE 3:  is the CDM group size of NZP CSI-RS specified for each test.  NOTE 4: It is only applicable to LTE-NR coexistence tests. | | |

## C.2.2 FR2 Measurement of Performance Characteristics

Unless otherwise stated, Table C.2.2-1 is applicable for measurements on the Performance Characteristics.

Table C.2.2-1: Downlink Physical Channels transmitted during a connection (TDD) for FR2

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value (Note 2)** |
| SSS transmit power | W | Test specific |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH to SSS | dB | 0 |
| EPRE ratio of PBCH to PBCH DMRS | dB | 0 |
| EPRE ratio of PDCCH to SSS | dB | 0 |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 |
| EPRE ratio of PDSCH to SSS | dB | 0 |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | Test specific (Note 1) |
| EPRE ratio of NZP CSI-RS to SSS | dB | -10\*log10(L) (Note 3) |
| EPRE ratio of PTRS to PDSCH | dB | Test specific (Note 4) |
| EPRE ratio of PDSCH OCNG to SSS | dB | 0 |
| EPRE ratio of PDCCH OCNG to SSS | dB | 0 |
| Note 1: Value is derived from Table 4.1-1 in TS 38.214 [12] based on "Number of DM-RS CDM groups without data" and "DMRS Type" parameters specified for each test  Note 2: The value is the energy of per RE for a single antenna port before pre-coding.  Note 3:  is the CDM group size of NZP CSI-RS specified for each test.  Note 4: Value is derived from Table 4.1-2 in TS 38.214 [12] based on “The number of PDSCH layers” and “*epre-Ratio*” parameters specified for each test. | | |

Annex D (normative):  
E-UTRA link setup config for NSA testing

# D.0 General

Below clauses define the E-UTRA link setup config for NSA Demodulation and CSI tests cases unless otherwise specified within the main test case.

# D.1 E-UTRA test parameters

Below are the common test parameters to be configured for E-UTRA link.

Table D.1-1: Common Test Parameters (FDD)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comments |
| Inter-TTI Distance |  | 1 |  |
| Number of HARQ processes | Processes | 8 | For FDD, 8 HARQ processes in the DL, as specified in TS 36.213 [10] clause 7. All 8 HARQ processes are used. |
| Scheduling of retransmissions |  |  | 1. Retransmissions use the same Transport Block Size (TBS) as the initial transmission.  2. HARQ processes are scheduled consecutively, independent of the fact, whether retransmissions (for negatively acknowledged HARQ processes) or new transmissions (for positively acknowledged HARQ processes) occur. |
| Maximum number of HARQ transmission |  | 4 | It is always 4 for FDD, as specified in TS 36.213 [10] clause 8 |
| Redundancy version coding sequence |  | {0,1,2,3} for QPSK |  |
| Number of OFDM symbols for PDCCH | OFDM symbols | 3 for 5 MHz bandwidths,  2 for 10 MHz, 20MHz | The PCFICH carries information about the number of OFDM symbols used for transmission of PDCCHs in a subframe, as specified in TS 36.211 [8] clause 6.7 |
| Cyclic Prefix |  | Normal | CP consist of the following physical resource blocks (RBs) parameters: 12 consecutive subcarriers at a 15 kHz spacing and 7 OFDM symbols, as specified in TS 36.211 [8] clause 6.2.3 |
| Cell ID |  | 0 (Note 1) | The Cell ID is uniquely defined by a number in the range of 0 to 503, representing the physical-layer cell identity, as specified in TS 36.211 [8] clause 6.11. |
| DCI format for PDSCH | Format 1A |  |  |
| DCI format for PUSCH | Format 0 |  |  |

Table D.1-2: Common Test Parameters (TDD)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comments |
| Uplink downlink configuration (Note 1) |  | 2 |  |
| Special subframe configuration (Note 2) |  | 5 |  |
| Inter-TTI Distance |  | 1 |  |
| Number of HARQ processes | Processes | 7 | For TDD, 7 HARQ processes in the DL, as specified in TS 36.213 [10] clause 7. All 7 HARQ processes are used. |
| Scheduling of retransmissions |  |  | 1. Retransmissions use the same Transport Block Size (TBS) as the initial transmission.  2. HARQ processes are scheduled consecutively, independent of the fact, whether retransmissions (for negatively acknowledged HARQ processes) or new transmissions (for positively acknowledged HARQ processes) occur.  3. In case when the initial transmission and the retransmissions are scheduled in subframes with a different *N*PRB (in terms of TS 36.213 [10] subclause 7.1.7) according to TS 36.213 [10] subclause 7.1.7.2 and the appropriate modulation is used. |
| Maximum number of HARQ transmission |  | 4 | It is always 4 for TDD, as specified in TS 36.213 [10] clause 8 |
| Redundancy version coding sequence |  | {0,1,2,3} for QPSK |  |
| Number of OFDM symbols for PDCCH | OFDM symbols | 3 for 5 MHz bandwidths,  2 for 10 MHz | The PCFICH carries information about the number of OFDM symbols used for transmission of PDCCHs in a subframe, as specified in TS 36.211 [8] clause 6.7 |
| Cyclic Prefix |  | Normal | CP consist of the following physical resource blocks (RBs) parameters: 12 consecutive subcarriers at a 15 kHz spacing and 7 OFDM symbols, as specified in TS 36.211 [8] clause 6.2.3 |
| Cell ID |  | 0 (Note 3) | The Cell ID is uniquely defined by a number in the range of 0 to 503, representing the physical-layer cell identity, as specified in TS 36.211 [8] clause 6.11. |
| DCI format for PDSCH | Format 1A |  |  |
| DCI format for PUSCH | Format 0 |  |  |
| NOTE 1: as specified in Table 4.2-2 in TS 36.211 [8].  NOTE 2: as specified in Table 4.2-1 in TS 36.211 [8].  NOTE 3: For CA tests, Cell ID = 0 applies only to P-Cell. For (n)*th* S-Cell, Cell ID = n is used. | | | |

# D.2 E-UTRA configuration

This clause defines the E-UTRA link settings for the test cases defined in clauses 5 and 6. The LTE link is supposed to be a functional link. The configuration defined in this clause ensures establishment of LTE link. Unless otherwise stated, ensure the UE is in state 3A-RF on the E-UTRA cell as defined in TS 36.508 [19].

Table D.2-1: E-UTRA configuration for EN-DC tests

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comments |
| Test Frequency during and after connection setup | Mid | As defined in TS 36.508 [19] for inter band test cases and as defined in TS 38.508-1 [6] clause 4.3.1 for intra band test cases, with NR SCS as per the test case for the LTE band under test |
| Bandwidth during and after connection setup | 5 MHz (Note 1) | Supported by all LTE bands |
| PDSCH transmission mode and antenna config | TM1 1x2 |  |
| OCNG pattern | OP.1 for FDD  OP.1 for TDD | These physical resource blocks are assigned to an arbitrary number of virtual UE*'* s with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| DL RMC | According to table A.3.2-1 in TS 36.521-1 [16] for FDD  According to table A.3.1.1-1 in TS 38.521-3 [21] for TDD | Note 1 |
| DL RB allocation | 25 | Full RB allocation assuming 5 MHz ChBW. 100 RB for 20 MHz ChBW as applicable |
| UL Signal levels during connection setup | PUSCH Power | Attained by enabling open loop power control and setting up UL signal levels according to Annexes H.0, H.2 and H.3 of TS 36.521-1 [16] |
| TA adjustments | *TimeAlignmentTimerDedicated* IE to be set to infinity | *TimeAlignmentTimerDedicated* IE to be set to infinity to ensure UE doesn't look for TA adjustments (See Table D.2-4) |
| CQI reports and SRS after connection setup | Disabled (See Table D.2-2 and D.2-3) | Disable periodic and aperiodic CQI reports to ensure none of these transmissions occur on the LTE uplink. |
| NOTE 1: If none of the UE supported EN-DC band combos support 5MHz E-UTRA carrier, configure 20 MHz channel BW. | | |

Table D.2-2: *CQI-ReportConfig-DEFAULT:* AdditionalE-UTRA Anchor Configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
| Information Element | Value/remark | Comment | Condition |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { |  |  |  |
| cqi-ReportModeAperiodic | NOT PRESENT |  |  |
| cqi-ReportPeriodic | NOT PRESENT |  |  |
| } |  |  |  |

Table D.2-3: *PhysicalConfigDedicated-DEFAULT:* Additional E-UTRA Anchor Configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [7] clause 4.8.2, Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
| Information Element | Value/remark | Comment | Condition |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { |  |  |  |
| soundingRS-UL-ConfigDedicated | Not present |  | RBC |
| } |  |  |  |

Table D.2-4: *MAC-MainConfig-RBC*: Additional E-UTRA Anchor Configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
| Information Element | Value/remark | Comment | Condition |
| timeAlignmentTimerDedicated | Infinity |  |  |

# D.3 E-UTRA link common physical channel setup

Table D.3-1 describes the downlink Physical Channels that are required for E-UTRA connection set up.

Table D.3-1: Downlink Physical Channels required for E-UTRA connection set-up

|  |  |  |
| --- | --- | --- |
| Physical Channel | EPRE Ratio | Note |
| PBCH | PBCH\_RA = 0 dB |  |
| PBCH\_RB = 0 dB |
| PSS | PSS\_RA = 0 dB |  |
| SSS | SSS\_RA = 0 dB |  |
| PCFICH | PCFICH\_RB = 0 dB |  |
| PDCCH | PDCCH\_RA = 0 dB |  |
| PDCCH\_RB = 0 dB |
| PDSCH | PDSCH\_RA = 0 dB |  |
| PDSCH\_RB = 0 dB |
| PHICH | PHICH\_RA = 0 dB |  |
| PHICH\_RB = 0 dB |
| NOTE 1: .  NOTE 2: PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | |

# D.4 E-UTRA power level

## D.4.1 E-UTRA power level (conducted)

Table D.4.1-1: DL power level for E-UTRA (conducted)

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comments |
| DL signal level | RS EPRE -85.0 dBm/15 kHz | The power level is specified at each UE Rx antenna |

## D.4.2 E-UTRA power level (radiated)

Table D.4.2-1: Downlink power levels for E-UTRA (radiated)

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comments |
| DL signal level | RS EPRE -100 dBm/15 kHz | The power level is specified at each UE Rx antenna |

Annex E (normative): Environmental conditions

FFS

Annex F (normative):  
Measurement uncertainties and test tolerances

The requirements of this clause apply to all tests in the present document.

# F.1 Measurement uncertainties and test tolerances for FR1

## F.1.1 Acceptable uncertainty of test system (normative)

The maximum acceptable uncertainty of the Test System is specified below for each test, where appropriate. The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified range, and the equipment under test to be measured with an uncertainty not exceeding the specified values. All ranges and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95 % is the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment.

For RF tests it should be noted that the uncertainties in clause F.1 apply to the Test System operating into a nominal 50 ohm load and do not include system effects due to mismatch between the DUT and the Test System.

The downlink signal uncertainties apply at each receiver antenna connector.

### F.1.1.1 Measurement of test environments

The measurement accuracy of the UE test environments defined in TS 38.508-1 [5] subclause 4.1, Test environments shall be

- Pressure 5 kPa.

- Temperature 2 degrees.

- Relative Humidity 5 %.

- DC Voltage 1,0 %.

- AC Voltage 1,5 %.

- Vibration 10 %.

- Vibration frequency 0,1 Hz.

The above values shall apply unless the test environment is otherwise controlled and the specification for the control of the test environment specifies the uncertainty for the parameter.

### F.1.1.2 Measurement of Demod Performance requirements

This clause defines the maximum test system uncertainty for Demod Performance requirements. The maximum test system uncertainty allowed for the measurement uncertainty contributors are defined in Table F.1.1.2-1.

Table F.1.1.2-1: Maximum measurement uncertainty values for the test system for FR1 (up to 6 GHz) and Channel BW ≤ 40 MHz

| MU contributor | Unit | Value | Comment |
| --- | --- | --- | --- |
| AWGN flatness and signal flatness, max deviation for any Resource Block, relative to average over BWconfig | dB | ±2.0 | Same as in LTE |
| Signal to noise ratio uncertainty | dB | ±0.3 | Same as in LTE |
| Signal to noise ratio variation | dB | ±0.5 | Same as in LTE |
| Fading profile power uncertainty for 1Tx | dB | ±0.5 | Same as in LTE |
| Fading profile power uncertainty for 2Tx | dB | ±0.7 | Same as in LTE |
| Fading profile power uncertainty for 4Tx | dB | ±0.7 | Same as in LTE |

The maximum test system uncertainty for test cases defined in section 5 is defined in Table F.1.1.2-2.

Table F.1.1.2-2: Maximum test system uncertainty for FR1 demodulation performance test cases

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Subclause | | | | Maximum Test System Uncertainty | | | | Derivation of Test System Uncertainty | | | |
| 5.2.1.1.1 1 Rx FDD FR1 PDSCH performance for RedCap | | | | ± 0.9 dB for > 10Hz doppler  ± 1 dB for 10Hz doppler | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.1.2.1 1Rx TDD FR1 PDSCH performance for RedCap | | | | ± 0.9 dB for > 10Hz doppler  ± 1 dB for 10Hz doppler | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.1\_1 2Rx FDD FR1 PDSCH mapping Type A performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | ± 0.9 dB for > 10Hz doppler  ± 1 dB for 10Hz doppler  ± 0.6 dB for test 1-6  ± 0.9 dB for test 1-7 | | | | Overall system uncertainty for fading conditions comprises four quantities:  1. Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  4. SNR uncertainty due to finite test time  Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2) + SNR uncertainty due to finite test time2  Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for 2Tx  AWGN flatness and signal flatness ±2.0 dB  SNR uncertainty due to finite test time ±0.3 dB for 10Hz Doppler, otherwise ±0.0 dB  For test point 1-6, Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2) = 0.6 dB  For test point 1-7, Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2) = 0.9 dB | | | |
| 5.2.2.1.1\_2 2Rx FDD FR1 PDSCH Mapping Type A performance - 2x2 MIMO with enhanced receiver type X for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.1\_3 2Rx FDD FR1 PDSCH Mapping Type A performance – 2x2 MIMO with baseline receiver for DL1024QAM for both SA and NSA | | | | ± 0.9 dB for test 1-8  Downlink EVM ≤ 2.5% for f ≤ 4.2 GHz  Downlink EVM ≤ [2.5%] for f > 4.2 GHz | | | | For test point 1-8, Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 ) = 0.9 dB  2.5% EVM is equivalent to a Test system downlink SNR of 32.04dB.  The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is not limited by the Test system EVM. | | | |
| 5.2.2.1.2\_1 2Rx FDD FR1 PDSCH mapping Type A and CSI-RS overlapped with PDSCH performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.3\_1 2Rx FDD FR1 PDSCH mapping Type B performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.4\_1 2Rx FDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance - 4x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.5\_1 2Rx FDD FR1 PDSCH 0.001% BLER performance - 1x2 MIMO with baseline receiver for both SA and NSA | | | | ± 0.6 dB | | | | Overall system uncertainty for fading conditions comprises four quantities:  1. Signal-to-noise ratio uncertainty  2. Effect of AWGN flatness and signal flatness  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2)  Signal-to-noise ratio uncertainty ±0.3 dB  AWGN flatness and signal flatness ±2.0 dB | | | |
| 5.2.2.1.6\_1 2Rx FDD FR1 PDSCH repetitions over multiple slots performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | ± 0.9dB | | | | Overall system uncertainty for fading conditions comprises four quantities:  1. Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  4. SNR uncertainty due to finite test time  Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2+ SNR uncertainty due to finite test time2)  Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for 2Tx  AWGN flatness and signal flatness ±2.0 dB  SNR uncertainty due to finite test time ±0.25 dB for 1% residual BLER  For test point 1-1, Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2) = 0.9 dB | | | |
| 5.2.2.1.7\_1 2Rx FDD FR1 PDSCH Mapping Type B and UE processing capability 2 performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.8\_1 2Rx FDD FR1 PDSCH pre-emption performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.9\_1 2Rx FDD FR1 HST-SFN performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | ± 0.6 dB | | | | Overall system uncertainty for fading conditions comprises four quantities:  1. Signal-to-noise ratio uncertainty, ±0.3 dB  2. Effect of AWGN flatness and signal flatness, ±2.0 dB  3. SNR uncertainty due to finite test time, ±0.0 dB for >10Hz Doppler.  Items 1, 2, 3 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2) = 0.6 dB | | | |
| 5.2.2.1.10\_1 2Rx FDD FR1 HST-DPS performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | ± 0.6 dB | | | | Overall system uncertainty for fading conditions comprises four quantities:  1. Signal-to-noise ratio uncertainty, ±0.3 dB  2. Effect of AWGN flatness and signal flatness, ±2.0 dB  3. SNR uncertainty due to finite test time, ±0.0 dB for >10Hz Doppler.  Items 1, 2, 3 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2) = 0.6 dB | | | |
| 5.2.2.1.11\_1 2Rx FDD FR1 PDSCH Single-DCI based SDM scheme performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.12\_1 2Rx FDD FR1 PDSCH Multiple-DCI based transmission scheme performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.13\_1 2Rx FDD FR1 PDSCH Single-DCI based FDM scheme A performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.14\_1 2Rx FDD FR1 PDSCH Single-DCI based Inter-slot TDM scheme performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.6\_1 | | | | Same as 5.2.2.1.6\_1 | | | |
| 5.2.2.1.15\_1 2Rx FDD FR1 PDSCH with inter-cell interference – 2x2 MIMO for both SA and NSA | | | | Es/Noc ± 0.8 dB for interfering cells | | | | Overall system uncertainty for fading conditions comprises two quantities:  1. Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2)  Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for Tx Diversity | | | |
| 5.2.2.1.16\_1 2Rx FDD FR1 PDSCH with intra-cell inter-user interference | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1  There is no additional measurement uncertainty introduced due to the co-scheduled UE | | | |
| 5.2.2.1.17 2Rx FDD FR1 PDSCH performance for RedCap | | | | ± 0.9 dB for > 10Hz doppler  ± 1 dB for 10Hz doppler | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.1.20 2Rx FDD FR1 PDSCH HST-SFN Scheme A performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.9\_1 | | | | Same as 5.2.2.1.9\_1 | | | |
| 5.2.2.1.21 2Rx FDD FR1 PDSCH HST-SFN Scheme B performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.9\_1 | | | | Same as 5.2.2.1.9\_1 | | | |
| 5.2.2.2.1\_1 2Rx TDD FR1 PDSCH mapping Type A performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | ± 0.9 dB for test 1-10  ± 0.6 dB for test 1-11  For other TPs, same as 5.2.2.1.1\_1 | | | | For test point 1-10, Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2) = 0.9 dB  For test point 1-11, Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2) = 0.6 dB  For other TPs, same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.1\_2 2Rx TDD FR1 PDSCH Mapping Type A performance - 2x2 MIMO with enhanced receiver type X for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.1\_3 2Rx TDD FR1 PDSCH Mapping Type A performance – 2x2 MIMO with baseline receiver for DL1024QAM for both SA and NSA | | | | ± 0.9 dB for test 1-12  Downlink EVM ≤ 2.5% for f ≤ 4.2 GHz  Downlink EVM ≤ [2.5%] for f > 4.2 GHz | | | | For test point 1-12, Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 ) = 0.9 dB  2.5% EVM is equivalent to a Test system downlink SNR of 32.04dB.  The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is not limited by the Test system EVM. | | | |
| 5.2.2.2.2\_1 2Rx TDD FR1 PDSCH mapping Type A and CSI-RS overlapped with PDSCH performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.3\_1 2Rx TDD FR1 PDSCH mapping Type B performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.4\_1 2Rx TDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance - 4x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.5\_1 2Rx TDD FR1 PDSCH 0.001% BLER performance - 1x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.5\_1 | | | | Same as 5.2.2.1.5\_1 | | | |
| 5.2.2.2.6\_1 2Rx TDD FR1 PDSCH repetitions over multiple slots performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.6\_1 | | | | Same as 5.2.2.1.6\_1 | | | |
| 5.2.2.2.7\_1 2Rx TDD FR1 PDSCH Mapping Type B and UE processing capability 2 performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.8\_1 2Rx TDD FR1 PDSCH pre-emption performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.9\_1 2Rx TDD FR1 HST-SFN performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.9\_1 | | | | Same as 5.2.2.1.9\_1 | | | |
| 5.2.2.2.10\_1 2Rx TDD FR1 HST-DPS performance - 2x2 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.10\_1 | | | | Same as 5.2.2.1.10\_1 | | | |
| 5.2.2.2.11\_1 2Rx TDD FR1 PDSCH Single-DCI based SDM scheme performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.12\_1 2Rx TDD FR1 PDSCH Multiple-DCI based transmission scheme performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.13\_1 2Rx TDD FR1 PDSCH Single-DCI based FDM scheme A performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.14\_1 2Rx TDD FR1 PDSCH Single-DCI based Inter-slot TDM scheme performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.6\_1 | | | | Same as 5.2.2.1.6\_1 | | | |
| 5.2.2.2.15 2Rx TDD FR1 PDSCH mapping Type A performance on band with shared spectrum access | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.16\_1 2Rx TDD FR1 for PDSCH with inter-cell interference – 2x2 MIMO for both NSA and SA | | | | Es/Noc ± 0.8 dB for interfering cells | | | | Overall system uncertainty for fading conditions comprises two quantities:  1. Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2)  Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for Tx Diversity | | | |
| 5.2.2.2.17\_1 2Rx TDD FR1 PDSCH with intra-cell inter-user interference | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1  There is no additional measurement uncertainty introduced due to the co-scheduled UE | | | |
| 5.2.2.2.18 2Rx TDD FR1 PDSCH performance for RedCap | | | | ± 0.9 dB for > 10Hz doppler  ± 1 dB for 10Hz doppler | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2.2.2.21 2Rx TDD FR1 PDSCH HST-SFN Scheme A performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.9\_1 | | | | Same as 5.2.2.1.9\_1 | | | |
| 5.2.2.2.22 2Rx TDD FR1 PDSCH HST-SFN Scheme B performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.2.1.9\_1 | | | | Same as 5.2.2.1.9\_1 | | | |
| 5.2.3.1.1\_1 4Rx FDD FR1 PDSCH mapping Type A performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | ± 0.9 dB for > 10Hz doppler  ± 1.0 dB for 10Hz doppler | | | | Overall system uncertainty for fading conditions comprises four quantities:  1. Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  4. SNR uncertainty due to finite test time  Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time 2)  Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for 2Tx  AWGN flatness and signal flatness ±2.0 dB  SNR uncertainty due to finite test time ±0.3 dB for 10Hz Doppler, otherwise ±0.0 dB | | | |
| 5.2.3.1.1\_2 4Rx FDD FR1 PDSCH mapping Type A performance - 4x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.1.1\_4 4Rx FDD FR1 PDSCH mapping Type A performance - 4x4 MIMO with enhanced receiver type 1 for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.1.1\_5 4Rx FDD FR1 PDSCH Mapping Type A performance – 2x4 MIMO with baseline receiver for DL1024QAM for both SA and NSA | | | | ± 0.9 dB for test 1-8  Downlink EVM ≤ 2.5% for f ≤ 4.2 GHz  Downlink EVM ≤ [2.5%] for f > 4.2 GHz | | | | For test point 1-8, Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 ) = 0.9 dB  2.5% EVM is equivalent to a Test system downlink SNR of 32.04dB.  The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is not limited by the Test system EVM. | | | |
| 5.2.3.1.2\_1 4Rx FDD FR1 PDSCH mapping Type A and CSI-RS overlapped with PDSCH performance - 4x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.1.3\_1 4Rx FDD FR1 PDSCH mapping Type B performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.1.4\_1 4Rx FDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance - 4x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.1.5\_1 4Rx FDD FR1 PDSCH 0.001% BLER performance - 1x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.5\_1 | | | | Same as 5.2.2.1.5\_1 | | | |
| 5.2.3.1.6\_1 4Rx FDD FR1 PDSCH repetitions over multiple slots performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.6\_1 | | | | Same as 5.2.2.1.6\_1 | | | |
| 5.2.3.1.7\_1 4Rx FDD FR1 PDSCH Mapping Type B and UE processing capability 2 performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.1.8\_1 4Rx FDD FR1 PDSCH pre-emption performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.1.9\_1 4Rx FDD FR1 HST-SFN performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.9\_1 | | | | Same as 5.2.2.1.9\_1 | | | |
| 5.2.3.1.10\_1 4Rx FDD FR1 HST-DPS performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.10\_1 | | | | Same as 5.2.2.1.10\_1 | | | |
| 5.2.3.1.11\_1 4Rx FDD FR1 PDSCH Single-DCI based SDM scheme performance - 2x4 MIMO for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.1.12\_1 4Rx FDD FR1 PDSCH Multiple-DCI based transmission scheme performance - 2x4 MIMO for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.1.13\_1 4Rx FDD FR1 PDSCH Single-DCI based FDM scheme A performance - 2x4 MIMO for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.1.14\_1 4Rx FDD FR1 PDSCH Single-DCI based Inter-slot TDM scheme performance - 2x4 MIMO for both SA and NSA | | | | Same as 5.2.3.1.6\_1 | | | | Same as 5.2.3.1.6\_1 | | | |
| 5.2.3.1.15\_1 4Rx FDD FR1 PDSCH with inter-cell interference – 2x4 MIMO for both SA and NSA | | | | Es/Noc ± 0.8 dB for interfering cells | | | | Overall system uncertainty for fading conditions comprises two quantities:  1. Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2)  Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for Tx Diversity | | | |
| 5.2.3.1.16\_1 4Rx FDD FR1 PDSCH with intra-cell inter-user interference – 2x4 MIMO for both NSA and SA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1  There is no additional measurement uncertainty introduced due to the co-scheduled UE | | | |
| 5.2.3.1.16\_2 4Rx FDD FR1 PDSCH with intra-cell inter-user interference – 4x4 MIMO for both NSA and SA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1  There is no additional measurement uncertainty introduced due to the co-scheduled UE | | | |
| 5.2.3.1.19 4Rx FDD FR1 PDSCH HST-SFN Scheme A performance - 2x4 MIMO for both SA and NSA | | | | Same as 5.2.3.1.9\_1 | | | | Same as 5.2.3.1.9\_1 | | | |
| 5.2.3.1.20 4Rx FDD FR1 PDSCH HST-SFN Scheme B performance - 2x4 MIMO for both SA and NSA | | | | Same as 5.2.3.1.9\_1 | | | | Same as 5.2.3.1.9\_1 | | | |
| 5.2.3.2.1\_1 4Rx TDD FR1 PDSCH mapping Type A performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.2.1\_2 4Rx TDD FR1 PDSCH mapping Type A performance - 4x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.2.1\_4 4Rx TDD FR1 PDSCH mapping Type A performance - 4x4 MIMO with enhanced receiver type 1 for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.2.1\_5 4Rx TDD FR1 PDSCH Mapping Type A performance – 2x4 MIMO with baseline receiver for DL1024QAM for both SA and NSA | | | | ± 0.9 dB for test 1-12  Downlink EVM ≤ 2.5% for f ≤ 4.2 GHz  Downlink EVM ≤ [2.5%] for f > 4.2 GHz | | | | For test point 1-12, Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 ) = 0.9 dB  2.5% EVM is equivalent to a Test system downlink SNR of 32.04dB.  The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is not limited by the Test system EVM. | | | |
| 5.2.3.2.2\_1 4Rx TDD FR1 PDSCH mapping Type A and CSI-RS overlapped with PDSCH performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.2.3\_1 4Rx TDD FR1 PDSCH mapping Type B performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.2.4\_1 4Rx TDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance - 4x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.2.5\_1 4Rx TDD FR1 PDSCH 0.001% BLER performance - 1x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.5\_1 | | | | Same as 5.2.2.1.5\_1 | | | |
| 5.2.3.2.6\_1 4Rx TDD FR1 PDSCH repetitions over multiple slots performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.2.1.6\_1 | | | | Same as 5.2.2.1.6\_1 | | | |
| 5.2.3.2.7\_1 4Rx TDD FR1 PDSCH Mapping Type B and UE processing capability 2 performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.2.9\_1 4Rx TDD FR1 HST-SFN performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.9\_1 | | | | Same as 5.2.3.1.9\_1 | | | |
| 5.2.3.2.10\_1 4Rx TDD FR1 HST DPS performance - 2x4 MIMO with baseline receiver for both SA and NSA | | | | Same as 5.2.3.1.10\_1 | | | | 5.2.3.1.10\_1 | | | |
| 5.2.3.2.11\_1 4Rx TDD FR1 PDSCH Single-DCI based SDM scheme performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.2.12\_1 4Rx TDD FR1 PDSCH Multiple-DCI based transmission scheme performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.2.13\_1 4Rx TDD FR1 PDSCH Single-DCI based FDM scheme A performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
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| 5.2.3.2.14\_1 4Rx TDD FR1 PDSCH Single-DCI based Inter-slot TDM scheme performance - 2x2 MIMO for both SA and NSA | | | | Same as 5.2.3.1.6\_1 | | | | Same as 5.2.3.1.6\_1 | | | |
| 5.2.3.2.15 4Rx TDD FR1 PDSCH mapping Type A performance on band with shared spectrum access | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2.3.2.16\_1 4Rx TDD FR1 for PDSCH with inter-cell interference – 2x4 MIMO for both NSA and SA | | | | Es/Noc ± 0.8 dB for interfering cells | | | | Overall system uncertainty for fading conditions comprises two quantities:  1. Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2)  Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for Tx Diversity | | | |
| 5.2.3.2.17\_1 4Rx TDD FR1 PDSCH with intra-cell inter-user interference – 2x4 MIMO for both NSA and SA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1  There is no additional measurement uncertainty introduced due to the co-scheduled UE | | | |
| 5.2.3.2.17\_2 4Rx TDD FR1 PDSCH with intra-cell inter-user interference – 4x4 MIMO for both NSA and SA | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1  There is no additional measurement uncertainty introduced due to the co-scheduled UE | | | |
| 5.2.3.2.20 4Rx TDD FR1 PDSCH HST-SFN Scheme A performance - 2x4 MIMO for both SA and NSA | | | | Same as 5.2.3.2.9\_1 | | | | Same as 5.2.3.2.9\_1 | | | |
| 5.2.3.2.21 4Rx TDD FR1 PDSCH HST-SFN Scheme B performance - 2x4 MIMO for both SA and NSA | | | | Same as 5.2.3.2.9\_1 | | | | Same as 5.2.3.2.9\_1 | | | |
| 5.2A.2.1.1 2Rx Normal PDSCH Demodulation Performance for CA (2DL CA) | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2A.2.1.2 2Rx Normal PDSCH Demodulation Performance for CA (3DL CA) | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2A.2.1.3 2Rx Normal PDSCH Demodulation Performance for CA (4DL CA) | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2A.2.2.1 2Rx PDSCH Demodulation Performance for CA with power imbalance (2DL CA) | | | | ±0.7 dB, f ≤ 3.0GHz  ±1.0 dB, 3.0GHz < f ≤ 4.2GHz  ±1.5 dB, 4.2GHz < f ≤ 6GHz  Downlink EVM ≤ 6% | | | | 6% EVM is equivalent to a Test system downlink SNR of 24.4dB. The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is limited by the Reference measurement channel and the UE capability, and not by the Test system EVM. | | | |
| 5.2A.2.3 2Rx TDD FR1 PDSCH mapping Type A performance of Scell on band with shared spectrum access | | | | Same as 5.2.2.1.1\_1 | | | | Same as 5.2.2.1.1\_1 | | | |
| 5.2A.2.4.1 2Rx PDSCH Demodulation Performance for HST-SFN CA | | | | Same as 5.2.2.1.9\_1 | | | | Same as 5.2.2.1.9\_1 | | | |
| 5.2A.2.5.1 2RX PDSCH Demodulation Performance for HST-DPS CA | | | | Same as 5.2.2.1.10\_1 | | | | Same as 5.2.2.1.10\_1 | | | |
| 5.2A.3.1.1 4Rx Normal PDSCH Demodulation Performance for CA (2DL CA) | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2A.3.1.2 4Rx Normal PDSCH Demodulation Performance for CA (3DL CA) | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2A.3.1.3 4Rx Normal PDSCH Demodulation Performance for CA (4DL CA) | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2A.3.2.1 4Rx PDSCH Demodulation Performance for CA with power imbalance (2DL CA) | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2A.3.3 4Rx TDD FR1 PDSCH mapping Type A performance of Scell on band with shared spectrum access | | | | Same as 5.2.3.1.1\_1 | | | | Same as 5.2.3.1.1\_1 | | | |
| 5.2A.3.4.1 4Rx PDSCH Demodulation Performance for HST-SFN CA | | | | Same as 5.2.2.1.9\_1 | | | | Same as 5.2.2.1.9\_1 | | | |
| 5.2A.3.5.1 4Rx PDSCH Demodulation Performance for HST-DPS CA | | | | Same as 5.2.2.1.10\_1 | | | | Same as 5.2.2.1.10\_1 | | | |
| 5.2A.3A.1.1 2Rx-4Rx Normal PDSCH Demodulation Performance for CA (2DL CA) | | | | Same as 5.2.2.1.1\_1 for 2Rx CC and 5.2.3.1.1\_1 for 4Rx CC | | | | Same as 5.2.2.1.1\_1 for 2Rx CC and 5.2.3.1.1\_1 for 4Rx CC | | | |
| 5.2A.3A.1.2 2Rx-4Rx Normal PDSCH Demodulation Performance for CA (3DL CA) | | | | Same as 5.2.2.1.1\_1 for 2Rx CC and 5.2.3.1.1\_1 for 4Rx CC | | | | Same as 5.2.2.1.1\_1 for 2Rx CC and 5.2.3.1.1\_1 for 4Rx CC | | | |
| 5.2A.3A.1.3 2Rx-4Rx Normal PDSCH Demodulation Performance for CA (3DL CA) | | | | Same as 5.2.2.1.1\_1 for 2Rx CC and 5.2.3.1.1\_1 for 4Rx CC | | | | Same as 5.2.2.1.1\_1 for 2Rx CC and 5.2.3.1.1\_1 for 4Rx CC | | | |
| 5.3.1.1.1 1Rx FDD FR1 PDCCH performance for RedCap | | | | Same as 5.3.2.1.2 | | | | Same as 5.3.2.1.2 | | | |
| 5.3.1.2.1 1Rx TDD FR1 PDCCH performance for RedCap | | | | Same as 5.3.2.1.2 | | | | Same as 5.3.2.1.2 | | | |
| 5.3.2.1.1 2Rx FDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | | | | ± 0.9 dB | | | | Overall system uncertainty for fading conditions comprises four quantities:  1. Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  4. SNR uncertainty due to finite test time  Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2+ SNR uncertainty due to finite test time2)  Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.5 dB for 1Tx  AWGN flatness and signal flatness ±2.0 dB  SNR uncertainty due to finite test time ±0.4 dB | | | |
| 5.3.2.1.2 2Rx FDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | | | | ± 1.0 dB | | | | Overall system uncertainty for fading conditions comprises four quantities:  1. Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  4. SNR uncertainty due to finite test time  Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2+ SNR uncertainty due to finite test time2)  Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for 2 Tx  AWGN flatness and signal flatness ±2.0 dB  SNR uncertainty due to finite test time ±0.4 dB | | | |
| 5.3.2.1.3 2Rx FDD FR1 PDCCH 1 Tx antenna performance for power saving | | | | Same as 5.3.2.1.1 | | | | Same as 5.3.2.1.1 | | | |
| 5.3.2.1.4 2Rx FDD FR1 PDCCH performance for RedCap | | | | ± 0.9 dB for Test 1  ± 1.0 dB for Test 2 | | | | Same as 5.2.3.1.1\_1  For Test 1, Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.5 dB for 1 Tx  AWGN flatness and signal flatness ±2.0 dB  SNR uncertainty due to finite test time ±0.4 dB  For Test 2, Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for 2 Tx  AWGN flatness and signal flatness ±2.0 dB  SNR uncertainty due to finite test time ±0.4 dB | | | |
| 5.3.2.1.5 2RX FDD Minimum requirements for PDCCH with intra-slot repetition | | | | Same as 5.3.2.1.1 | | | | Same as 5.3.2.1.1 | | | |
| 5.3.2.2.1 2Rx TDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | | | | Same as 5.3.2.1.1 | | | | Same as 5.3.2.1.1 | | | |
| 5.3.2.2.2 2Rx TDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | | | | Same as 5.3.2.1.2 | | | | Same as 5.3.2.1.2 | | | |
| 5.3.2.2.3 2Rx TDD FR1 PDCCH 1 Tx antenna performance for power saving | | | | Same as 5.3.2.1.1 | | | | Same as 5.3.2.1.1 | | | |
| 5.3.2.2.4 2Rx TDD FR1 PDCCH performance for RedCap | | | | ± 0.8 dB for Test 1  ± 0.9 dB for Test 2 | | | | Same as 5.2.3.1.1\_1  For Test 1, Signal-to-noise ratio uncertainty 0.3 dB  Fading profile power uncertainty ±0.5 dB for 1 Tx  AWGN flatness and signal flatness ±2.0 dB  SNR uncertainty due to finite test time 0 dB  For Test 2, Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for 2 Tx  AWGN flatness and signal flatness ±2.0 dB  SNR uncertainty due to finite test time 0 dB | | | |
| 5.3.2.2.5 2RX TDD Minimum requirements for PDCCH with intra-slot repetition | | | | Same as 5.3.2.1.1 | | | | Same as 5.3.2.1.1 | | | |
| 5.3.3.1.1 4Rx FDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | | | | Same as 5.3.2.1.1 | | | | Same as 5.3.2.1.1 | | | |
| 5.3.3.1.2 4Rx FDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | | | | Same as 5.3.2.1.2 | | | | Same as 5.3.2.1.2 | | | |
| 5.3.3.1.3 4Rx FDD FR1 PDCCH 1 Tx antenna performance for power saving | | | | Same as 5.3.2.1.1 | | | | Same as 5.3.2.1.1 | | | |
| 5.3.3.1.4 4RX FDD Minimum requirements for PDCCH with intra-slot repetition | | | | Same as 5.3.2.1.2 | | | | Same as 5.3.2.1.2 | | | |
| 5.3.3.2.1 4Rx TDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | | | | Same as 5.3.2.1.1 | | | | Same as 5.3.2.1.1 | | | |
| 5.3.3.2.2 4Rx TDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | | | | Same as 5.3.2.1.2 | | | | Same as 5.3.2.1.2 | | | |
| 5.3.3.2.3 4Rx TDD FR1 PDCCH 1 Tx antenna performance for power saving | | | | Same as 5.3.2.1.1 | | | | Same as 5.3.2.1.1 | | | |
| 5.3.3.2.4 4RX TDD Minimum requirements for PDCCH with intra-slot repetition | | | | Same as 5.3.2.1.2 | | | | Same as 5.3.2.1.2 | | | |
| 5.5A.1.1 FR1 SDR performance for CA (2DL CA) | | | | Same as 5.5.1 | | | | Same as 5.5.1 | | | |
| 5.5A.1.2 FR1 SDR performance for CA (3DL CA) | | | | Same as 5.5.1 | | | | Same as 5.5.1 | | | |
| 5.5A.1.3 FR1 SDR performance for CA (4DL CA) | | | | Same as 5.5.1 | | | | Same as 5.5.1 | | | |
| 5.5A.1.4 FR1 SDR performance for CA (5DL CA) | | | | Same as 5.5.1 | | | | Same as 5.5.1 | | | |
| 5.5.1 FR1 Sustained downlink data rate performance for single carrier | | | | ±0.7 dB, f ≤ 3.0GHz  ±1.0 dB, 3.0GHz < f ≤ 4.2GHz  ±1.5 dB, 4.2GHz < f ≤ 6GHz  Downlink EVM ≤ 3% | | | | 3% EVM is equivalent to a Test system downlink SNR of 30.5dB. The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is limited by the Reference measurement channel and the UE capability, and not by the Test system EVM. | | | |
| 5.5.2 FR1 Sustained downlink data rate performance for single carrier with DL1024QAM | | | | ±0.7 dB, f ≤ 3.0GHz  ±1.0 dB, 3.0GHz < f ≤ 4.2GHz  ±1.5 dB, 4.2GHz < f ≤ 6GHz  Downlink EVM ≤ 2.5% | | | | 2.5% EVM is equivalent to a Test system downlink SNR of 32.04dB. The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is limited by the Reference measurement channel and the UE capability, and not by the Test system EVM. | | | |
| 5.5.3 FR1 Sustained downlink data rate performance for RedCap | | | | ±0.7 dB, f ≤ 3.0GHz  ±1.0 dB, 3.0GHz < f ≤ 4.2GHz  ±1.5 dB, 4.2GHz < f ≤ 6GHz  Downlink EVM ≤ 3% | | | | 3% EVM is equivalent to a Test system downlink SNR of 30.5dB. The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is limited by the Reference measurement channel and the UE capability, and not by the Test system EVM. | | | |
| 9.4B.1.1 Sustained downlink data rate performance for EN-DC within FR1 | | | | E-UTRA CC:  ±0.7 dB, f ≤ 3.0GHz  ±1.0 dB, 3.0GHz < f ≤ 4.2GHz  NR CC:  Same as 5.5.1 | | | | Same as 5.5.1 | | | |
| 9.4B.1.1\_1 Sustained downlink data rate performance for EN-DC within FR1 (2 NR CCs) | | | | Same as 9.4B.1.1 | | | | Same as 9.4B.1.1 | | | |
| 9.4B.1.1\_2 Sustained downlink data rate performance for EN-DC within FR1 (3 NR CCs) | | | | Same as 9.4B.1.1 | | | | Same as 9.4B.1.1 | | | |
| 9.4B.1.1\_3 Sustained downlink data rate performance for EN-DC within FR1 (3 NR CCs) | | | | Same as 9.4B.1.1 | | | | Same as 9.4B.1.1 | | | |
| 11.1.2.1.1\_1 2Rx FR1 PSSCH performance - single active PSSCH link | | | | ± 0.8 dB | | | | Overall system uncertainty for fading conditions comprises three quantities:  1. Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2)  Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.5 dB for single Tx  AWGN flatness and signal flatness ±2.0 dB | | | |
| 11.1.3.1.1\_1 2Rx FR1 PSCCH performance - single active PSSCH link | | | | Same as 11.1.2.1.1\_1 | | | | Same as 11.1.2.1.1\_1 | | | |
| 11.1.5.1.1\_1 2Rx FR1 PSCCH performance - single active PSSCH link | | | | Same as 11.1.2.1.1\_1 | | | | Same as 11.1.2.1.1\_1 | | | |
| 11.1.6.1.1\_1 2Rx FR1 Power imbalance performance - two active PSSCH link | | | | ± 0.6 dB | | | | Overall system uncertainty for fading conditions comprises two quantities:  1. Signal-to-noise ratio uncertainty  2. Effect of AWGN flatness and signal flatness  Items 1, and 2 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2)  Signal-to-noise ratio uncertainty ±0.3 dB  AWGN flatness and signal flatness ±2.0 dB | | | |
| 11.1.7.1.1\_1 2Rx FR1 HARQ buffer soft combining performance - maximum number of HARQ processes | | | | Same as 11.1.2.1.1\_1 | | | | Same as 11.1.2.1.1\_1 | | | |
| 11.1.8.1.1\_1 2Rx FR1 PSCCH decoding capability - maximum number of received PSCCHs | | | | Downlink absolute  power uncertainty,  averaged over BWConfig  ±1.0 dB  Downlink EVM ≤ 3% | | | | 3% EVM is equivalent to a Test system  downlink SNR of 30.5dB. The noise from the  Test system is then sufficiently below that  required for the UE to demodulate the signal  with the required % success rate. Under these  conditions the UE throughput is limited by the  Reference measurement channel and the UE  capability, and not by the Test system EVM. | | | |
| 11.1.9.1.1\_1 2Rx FR1 PSFCH decoding capability - maximum number of received PSFCHs | | | | Same as 11.1.8.1.1\_1 | | | | Same as 11.1.8.1.1\_1 | | | |

### F.1.1.3 Measurement of Channel State Information reporting

This clause defines the maximum test system uncertainty for channel state information reporting requirements. The maximum test system uncertainty allowed for the measurement uncertainty contributors are defined in Table F.1.1.3-1.

Table F.1.1.3-1: Maximum measurement uncertainty values for the test system for FR1 (up to 6 GHz) and Channel BW ≤ 40 MHz

| MU contributor | Unit | Value | Comment |
| --- | --- | --- | --- |
| AWGN flatness and signal flatness, max deviation for any Resource Block, relative to average over BWconfig | dB | Same as in table F.1.1.2-1 |  |
| Signal to noise ratio uncertainty | dB | Same as in table F.1.1.2-1 |  |
| Signal to noise ratio variation | dB | Same as in table F.1.1.2-1 |  |
| Fading profile power uncertainty for 1Tx | dB | Same as in table F.1.1.2-1 |  |
| Fading profile power uncertainty for 2Tx | dB | Same as in table F.1.1.2-1 |  |
| Fading profile power uncertainty for 4Tx | dB | Same as in table F.1.1.2-1 |  |

The maximum test system uncertainty for test cases defined in section 6 is defined in Table F.1.1.3-2.

Table F.1.1.3-2: Maximum test system uncertainty for FR1 channel state information reporting test cases

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Subclause | | Maximum Test System Uncertainty | | Derivation of Test System Uncertainty | |
| 6.2.1.1.1.1 1Rx FDD FR1 periodic CQI reporting under AWGN conditions for RedCap | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.1.1.2.1 1Rx FDD FR1 periodic wideband CQI reporting under fading conditions for RedCap | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2.1.2.1.1 1Rx TDD FR1 periodic CQI reporting under AWGN conditions for RedCap | | Same as 6.2.2.2.1.1 | | Same as 6.2.2.2.1.1 | |
| 6.2.2.1.1.1 2Rx FDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | | +/- 0.3 dB | | Overall system uncertainty for AWGN conditions comprises:  Signal-to-noise ratio uncertainty ±0.3 dB  *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* | |
| 6.2.2.1.1.2 2Rx FDD FR1 periodic CQI reporting with Table 3 under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.2.1.1.3 2Rx FDD FR1 periodic CQI reporting with Table 4 under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.2.1.1.4 2Rx FDD FR1 periodic CQI reporting under AWGN conditions for RedCap | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.2.1.2.1 2Rx FDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | | +/- 0.8 dB | | Overall system uncertainty for fading conditions comprises two quantities:  1. Signal-to-noise ratio uncertainty ±0.3 dB  2. Fading profile power uncertainty for 2Tx ±0.7 dB  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:  Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2)  *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* | |
| 6.2.2.1.2.2 2Rx FDD FR1 aperiodic subband CQI reporting under fading conditions for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2.2.1.2.4 2Rx FDD FR1 periodic wideband CQI reporting under fading conditions for RedCap | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2.2.2.1.1 2Rx TDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.2.2.1.2 2Rx TDD FR1 periodic CQI reporting with Table 3 under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.2.2.1.3 2Rx TDD FR1 CQI reporting for PCell on band with shared spectrum access under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.2.2.1.4 2Rx TDD FR1 periodic CQI reporting with Table 4 under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.2.2.1.5 2Rx TDD FR1 periodic CQI reporting under AWGN conditions for RedCap | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.2.2.2.1 2Rx TDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2.2.2.2.2 2Rx TDD FR1 aperiodic subband CQI reporting under fading conditions for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2.2.2.2.4 2Rx TDD FR1 periodic wideband CQI reporting under fading conditions for RedCap | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2.3.1.1.1 4Rx FDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.3.1.1.2 4Rx FDD FR1 periodic CQI reporting with Table 3 under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.3.1.1.3 4Rx FDD FR1 periodic CQI reporting with Table 4 under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.3.1.2.1 4Rx FDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2.3.1.2.2 4Rx FDD FR1 aperiodic subband CQI reporting under fading conditions for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2.3.2.1.1 4Rx TDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.3.2.1.4 4Rx TDD FR1 periodic CQI reporting with Table 4 under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.3.2.1.3 4Rx TDD FR1 CQI reporting for PCell on band with shared spectrum access under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.2.3.2.2.1 4Rx TDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2.3.2.2.2 4Rx TDD FR1 aperiodic subband CQI reporting under fading conditions for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2A.3.1.1 2Rx CQI reporting accuracy under AWGN conditions for CA (2DL CA) | | Same as 6.2.2.1.1.1 for each CC | | Same as 6.2.2.1.1.1 | |
| 6.2A.3.1.2 2Rx CQI reporting accuracy under AWGN conditions for CA (3DL CA) | | Same as 6.2.2.1.1.1 for each CC | | Same as 6.2.2.1.1.1 | |
| 6.2A.3.1.3 2Rx CQI reporting accuracy under AWGN conditions for CA (4DL CA) | | Same as 6.2.2.1.1.1 for each CC | | Same as 6.2.2.1.1.1 | |
| 6.3.1.1.1 1Rx FDD Single PMI with 4TX TypeI-SinglePanel Codebook for RedCap | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.1.2.1 1Rx TDD Single PMI with 4TX TypeI-SinglePanel Codebook for RedCap | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.1.1 2Rx FDD FR1 Single PMI with 4Tx Type I- SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.1.2 2Rx FDD FR1 Single PMI with 8Tx Type I – SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.1.3 2Rx FDD FR1 Multiple PMI with 16Tx Type I – SinglePanel Codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.1.4 2Rx FDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.1.5 2Rx FDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.1.7 2Rx FDD FR1 Single PMI with 8TX TypeI-SinglePanel codebook for both SA and NSA | | 6.3.2.1.7 2Rx FDD FR1 Single PMI with 8TX TypeI-SinglePanel codebook for both SA and NSA | | 6.3.2.1.7 2Rx FDD FR1 Single PMI with 8TX TypeI-SinglePanel codebook for both SA and NSA | |
| 6.3.2.1.6 2Rx FDD FR1 Multiple PMI with 16Tx Enhanced TypeII codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.2.3.2.1.2 4Rx TDD FR1 periodic CQI reporting with Table 3 under AWGN conditions for both SA and NSA | | Same as 6.2.2.1.1.1 | | Same as 6.2.2.1.1.1 | |
| 6.3.2.2.1 2Rx TDD FR1 Single PMI with 4Tx TypeI – SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.2.2 2Rx TDD FR1 Single PMI with 8Tx TypeI – SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.2.3 2Rx TDD FR1 Single PMI with 16Tx Type1 – SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.2.4 2Rx TDD FR1 Single PMI with 32Tx Type1 – SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.2.6 2Rx TDD FR1 Multiple PMI with 16Tx Enhanced TypeII codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.2.7 2Rx TDD Single PMI with 4TX TypeI-SinglePanel Codebook for RedCap | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.2.8 Single PMI with 8 ports TypeI-SinglePanel Codebook for Single-DCI based transmission scheme | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.1.1 Single PMI with 4TX TypeI-SinglePanel Codebook– SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.1.2 Single PMI with 8TX TypeI-SinglePanel Codebook– SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.1.3 4Rx FDD FR1 Multiple PMI with 16Tx Type I – SinglePanel Codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.1.4 4Rx FDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.1.5 4Rx FDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.1.6 4Rx FDD FR1 Multiple PMI with 16Tx Enhanced TypeII codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.1.7 Single PMI with 8 ports TypeI-SinglePanel Codebook for Single-DCI based transmission scheme | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.2.1 4Rx TDD FR1 Single PMI with 4Tx Type1 - SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.2.2.5 2Rx TDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.2.2 4Rx TDD FR1 Single PMI with 8Tx Type1 - SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.2.3 4Rx TDD FR1 Single PMI with 16Tx Type1 - SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.2.4 4Rx TDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.2.5 4Rx TDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.2.6 4Rx TDD FR1 Multiple PMI with 16Tx Enhanced TypeII codebook for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.3.3.2.7 Single PMI with 8 ports TypeI-SinglePanel Codebook for Single-DCI based transmission scheme | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.4.2.1\_1 2Rx FDD FR1 RI reporting for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.4.2.1.1 2Rx FDD FR1 RI reporting for RedCap | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.4.2.2\_1 2Rx TDD FR1 RI reporting for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.4.2.2.1 2Rx TDD FR1 RI reporting for RedCap | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.4.3.1\_1 4Rx FDD FR1 RI reporting for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |
| 6.4.3.2\_1 4Rx TDD FR1 RI reporting for both SA and NSA | | Same as 6.2.2.1.2.1 | | Same as 6.2.2.1.2.1 | |

## F.1.2 Interpretation of measurement results (normative)

The measurement results returned by the Test System are compared – without any modification – against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ETR 273-1-2 clause 6.5.

The actual measurement uncertainty of the Test System for the measurement of each parameter shall be included in the test report.

The recorded value for the Test System uncertainty shall be, for each measurement, equal to or lower than the appropriate figure in clause F.1 of the present document.

If the Test System for a test is known to have a measurement uncertainty greater than that specified in clause F.1, it is still permitted to use this apparatus provided that an adjustment is made value as follows:

Any additional uncertainty in the Test System over and above that specified in clause F.1 shall be used to tighten the Test Requirement, making the test harder to pass. For some tests, for example receiver tests, this may require modification of stimulus signals. This procedure will ensure that a Test System not compliant with clause F.1does not increase the chance of passing a device under test where that device would otherwise have failed the test if a Test System compliant with clause F.1 had been used.

## F.1.3 Test Tolerance and Derivation of Test Requirements (informative)

The Test Requirements in the present document have been calculated by relaxing the Minimum Requirements of the core specification using the Test Tolerances defined in this clause. When the Test Tolerance is zero, the Test Requirement will be the same as the Minimum Requirement. When the Test Tolerance is non-zero, the Test Requirements will differ from the Minimum Requirements, and the formula used for the relaxation is given in this clause.

The Test Tolerances are derived from Test System uncertainties, regulatory requirements and criticality to system performance. As a result, the Test Tolerances may sometimes be set to zero.

The test tolerances should not be modified for any reason e.g. to take account of commonly known test system errors (such as mismatch, cable loss, etc.).

The downlink Test Tolerances apply at each receiver antenna connector.

### F.1.3.1 Measurement of test environments

The UE test environments are set to the values defined in TS 36.508 subclause 4.1, without any relaxation. The applied Test Tolerance is therefore zero.

### F.1.3.2 Measurement of Demod Performance requirements

The derivation of the test requirements for the test cases in section 5 is defined in Table F.1.3.2-1.

Table F.1.3.2-1: Derivation of Test Requirements (FR1 demodulation performance tests)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test | Minimum Requirement in TS 38.101-4 | Test Tolerance (TT) | Test Requirement in TS 38.521-4 | |
| 5.2.1.1.1 1 Rx FDD FR1 PDSCH performance for RedCap | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.1.2.1 1Rx TDD FR1 PDSCH performance for RedCap | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.1\_1 2Rx FDD FR1 PDSCH mapping Type A performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler 0.6 dB for test 1-6  0.9 dB for test 1-7 | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.1\_2 2Rx FDD FR1 PDSCH Mapping Type A performance - 2x2 MIMO with enhanced receiver type X for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.1\_3 2Rx FDD FR1 PDSCH Mapping Type A performance - 2x2 MIMO with baseline receiver for DL1024QAM for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.2\_1 2Rx FDD FR1 PDSCH mapping Type A and CSI-RS overlapped with PDSCH performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.3\_1 2Rx FDD FR1 PDSCH mapping Type B performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.4\_1 2Rx FDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance - 4x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.5\_1 2Rx FDD FR1 PDSCH 0.001% BLER performance - 1x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 + 0.5 = 1.1 dB | Additional relaxation of 0.5 dB added to the SNR to ensure early pass for a compliant device within a reasonable test duration  Formula: SNR + TT + additional relaxation  T-put limit unchanged | |
| 5.2.2.1.6\_1 2Rx FDD FR1 PDSCH repetitions over multiple slots performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT |
| 5.2.2.1.7 2Rx FDD FR1 PDSCH Mapping Type B and UE processing capability 2 performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.8\_1 2Rx FDD FR1 PDSCH pre-emption performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.9\_1 2Rx FDD FR1 HST-SFN performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.10\_1 2Rx FDD FR1 HST-DPS performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.11\_1 2Rx FDD FR1 PDSCH Single-DCI based SDM scheme performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.12\_1 2Rx FDD FR1 PDSCH Multiple-DCI based transmission scheme performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.13\_1 2Rx FDD FR1 PDSCH Single-DCI based FDM scheme A performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.14\_1 2Rx FDD FR1 PDSCH Single-DCI based Inter-slot TDM scheme performance - 2x2 MIMO for both SA and NSA | SNRs as specified | [0.7] | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.15\_1 2Rx FDD FR1 PDSCH with inter-cell interference – 2x2 MIMO for both SA and NSA | SNRs as specified | 1.7 dB for Test 1-1  1.8 dB for Test 1-2 | Formula: SNR + TT  T-put limit unchanged  The analysis is recorded in 3GPP TR 38.903 [26] | |
| 5.2.2.1.16\_1 2Rx FDD FR1 PDSCH intra-cell inter-user interference | SNRs as specified | 0.9 dB for > 10 Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.17 2Rx FDD FR1 PDSCH performance for RedCap | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.20 2Rx FDD FR1 PDSCH HST-SFN Scheme A performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.1.21 2Rx FDD FR1 PDSCH HST-SFN Scheme B performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.1\_1 2Rx TDD FR1 PDSCH mapping Type A performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler  0.9 dB for test 1-10  0.6 dB for test 1-11 | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.1\_2 2Rx TDD FR1 PDSCH Mapping Type A performance - 2x2 MIMO with enhanced receiver type X for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.1\_3 2Rx TDD FR1 PDSCH Mapping Type A performance - 2x2 MIMO with baseline receiver for DL1024QAM for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.2\_1 2Rx TDD FR1 PDSCH mapping Type A and CSI-RS overlapped with PDSCH performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.3\_1 2Rx TDD FR1 PDSCH mapping Type B performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.4\_1 2Rx TDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance - 4x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.5\_1 2Rx FDD FR1 PDSCH 0.001% BLER performance - 1x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 + 0.5 = 1.1 dB | Additional relaxation of 0.5 dB added to the SNR to ensure early pass for a compliant device within a reasonable test duration  Formula: SNR + TT + additional relaxation  T-put limit unchanged | |
| 5.2.2.2.6\_1 2Rx TDD FR1 PDSCH repetitions over multiple slots performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT | |
| 5.2.2.2.7\_1 2Rx TDD FR1 PDSCH Mapping Type B and UE processing capability 2 performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.8\_1 2Rx TDD FR1 PDSCH pre-emption performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.9\_1 2Rx TDD FR1 HST-SFN performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.10\_1 2Rx TDD FR1 HST-DPS performance - 2x2 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.11\_1 2Rx TDD FR1 PDSCH Single-DCI based SDM scheme performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.12\_1 2Rx TDD FR1 PDSCH Multiple-DCI based transmission scheme performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.13\_1 2Rx TDD FR1 PDSCH Single-DCI based FDM scheme A performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.14\_1 2Rx TDD FR1 PDSCH Single-DCI based Inter-slot TDM scheme performance - 2x2 MIMO for both SA and NSA | SNRs as specified | [0.7dB] | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.16\_1 2Rx TDD FR1 for PDSCH with inter-cell interference – 2x2 MIMO for both NSA and SA | SNRs as specified | 1.7 dB for Test 1-1  1.8 dB for Test 1-2 | Formula: SNR + TT  T-put limit unchanged  The analysis is recorded in 3GPP TR 38.903 [26] | |
| 5.2.2.2.17\_1 2Rx TDD FR1 PDSCH intra-cell inter-user interference | SNRs as specified | 0.9 dB for > 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.15 2Rx TDD FR1 PDSCH mapping Type A performance on band with shared spectrum access | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.18 2Rx TDD FR1 PDSCH performance for RedCap | SNRs as specified | 0.9 dB for > 10Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.21 2Rx TDD FR1 PDSCH HST-SFN Scheme A performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.2.2.22 2Rx TDD FR1 PDSCH HST-SFN Scheme B performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.1\_1 4Rx FDD FR1 PDSCH mapping Type A performance - 2x4 MIMO baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.1\_2 4Rx FDD FR1 PDSCH mapping Type A performance - 4x4 MIMO baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.1\_4 4Rx FDD FR1 PDSCH mapping Type A performance - 4x4 MIMO with enhanced receiver type 1 for both SA and NSA | SNRs as specified | 0.9 dB for > 10Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.1\_5 4Rx FDD FR1 PDSCH Mapping Type A performance - 2x4 MIMO with baseline receiver for DL1024QAM for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.2\_1 4Rx FDD FR1 PDSCH mapping Type A and CSI-RS overlapped with PDSCH performance - 4x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.3\_1 4Rx FDD FR1 PDSCH mapping Type B performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.4\_1 4Rx FDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance - 4x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.5\_1 4Rx FDD FR1 PDSCH 0.001% BLER performance - 1x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 + 0.5 = 1.1 dB | Additional relaxation of 0.5 dB added to the SNR to ensure early pass for a compliant device within a reasonable test duration  Formula: SNR + TT + additional relaxation  T-put limit unchanged | |
| 5.2.3.1.6\_1 4Rx FDD FR1 PDSCH repetitions over multiple slots performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9dB | Formula: SNR + TT | |
| 5.2.3.1.7\_1 4Rx FDD FR1 PDSCH Mapping Type B and UE processing capability 2 performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.8\_1 4Rx FDD FR1 PDSCH pre-emption performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.9\_1 4Rx FDD FR1 HST-SFN performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.10\_1 4Rx FDD FR1 HST-DPS performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.11\_1 4Rx FDD FR1 PDSCH Single-DCI based SDM scheme performance - 2x4 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.12\_1 4Rx FDD FR1 PDSCH Multiple-DCI based transmission scheme performance - 2x4 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.13\_1 4Rx FDD FR1 PDSCH Single-DCI based FDM scheme A performance - 2x4 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.15\_1 4Rx FDD FR1 PDSCH with inter-cell interference – 2x4 MIMO for both SA and NSA | SNRs as specified | 1.7 dB for Test 1-1  1.8 dB for Test 1-2 | Formula: SNR + TT  T-put limit unchanged  The analysis is recorded in 3GPP TR 38.903 [26] | |
| 5.2.3.1.16\_1 4Rx FDD FR1 PDSCH intra-cell inter-user interference – 2x4 MIMO for both NSA and SA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.16\_2 4Rx FDD FR1 PDSCH intra-cell inter-user interference – 4x4 MIMO for both NSA and SA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.19 4Rx FDD FR1 PDSCH HST-SFN Scheme A performance - 2x4 MIMO for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.20 4Rx FDD FR1 PDSCH HST-SFN Scheme B performance - 2x4 MIMO for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.1.14\_1 4Rx FDD FR1 PDSCH Single-DCI based Inter-slot TDM scheme performance - 2x4 MIMO for both SA and NSA | SNRs as specified | [0.7dB] | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.1\_5 4Rx TDD FR1 PDSCH Mapping Type A performance – 2x4 MIMO with baseline receiver for DL1024QAM for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.2\_1 4Rx TDD FR1 PDSCH mapping Type A and CSI-RS overlapped with PDSCH performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.3\_1 4Rx TDD FR1 PDSCH mapping Type B performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.4\_1 4Rx TDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance - 4x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.5\_1 4Rx TDD FR1 PDSCH 0.001% BLER performance - 1x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 + 0.5 = 1.1 dB | Additional relaxation of 0.5 dB added to the SNR to ensure early pass for a compliant device within a reasonable test duration  Formula: SNR + TT + additional relaxation  T-put limit unchanged | |
| 5.2.3.2.6\_1 4Rx TDD FR1 PDSCH repetitions over multiple slots performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.9dB | Formula: SNR + TT | |
| 5.2.3.2.7\_1 4Rx TDD FR1 PDSCH Mapping Type B and UE processing capability 2 performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.8\_1 4Rx TDD FR1 PDSCH pre-emption performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.9\_1 4Rx TDD FR1 HST-SFN performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.10\_1, 4Rx TDD FR1 HST DPS performance - 2x4 MIMO with baseline receiver for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.11\_1 4Rx TDD FR1 PDSCH Single-DCI based SDM scheme performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.12\_1 4Rx TDD FR1 PDSCH Multiple-DCI based transmission scheme performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.13\_1 4Rx TDD FR1 PDSCH Single-DCI based FDM scheme A performance - 2x2 MIMO for both SA and NSA | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.14\_1 4Rx TDD FR1 PDSCH Single-DCI based Inter-slot TDM scheme performance - 2x2 MIMO for both SA and NSA | SNRs as specified | [0.7dB] | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.16\_1 4Rx TDD FR1 for PDSCH with inter-cell interference – 2x4 MIMO for both NSA and SA | SNRs as specified | 1.7 dB for Test 1-1  1.8 dB for Test 1-2 | Formula: SNR + TT  T-put limit unchanged  The analysis is recorded in 3GPP TR 38.903 [26] | |
| 5.2.3.2.17\_1 4Rx TDD FR1 PDSCH intra-cell inter-user interference – 2x4 MIMO for both NSA and SA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.17\_2 4Rx TDD FR1 PDSCH intra-cell inter-user interference – 4x4 MIMO for both NSA and SA | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.15 4Rx TDD FR1 PDSCH mapping Type A performance on band with shared spectrum access | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.20 4Rx TDD FR1 PDSCH HST-SFN Scheme A performance - 2x4 MIMO for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2.3.2.21 4Rx TDD FR1 PDSCH HST-SFN Scheme B performance - 2x4 MIMO for both SA and NSA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.2.1.1 2Rx Normal PDSCH Demodulation Performance for CA (2DL CA) | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.2.1.2 2Rx Normal PDSCH Demodulation Performance for CA (3DL CA) | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.2.1.3 2Rx Normal PDSCH Demodulation Performance for CA (4DL CA) | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.2.2.1 2Rx PDSCH Demodulation Performance for CA with power imbalance (2DL CA) | Power level as specified | No TT added | T-put limit unchanged | |
| 5.2A.2.3 2Rx TDD FR1 PDSCH mapping Type A performance of Scell on band with shared spectrum access | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.2.4.1 2RX PDSCH Demodulation Performance for HST-SFN CA | SNR as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.2.5.1 2RX PDSCH Demodulation Performance for HST-DPS CA | SNR as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.3.1.1 4Rx Normal PDSCH Demodulation Performance for CA (2DL CA) | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.3.1.2 4Rx Normal PDSCH Demodulation Performance for CA (3DL CA) | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.3.1.3 4Rx Normal PDSCH Demodulation Performance for CA (4DL CA) | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.3.2.1 4Rx PDSCH Demodulation Performance for CA with power imbalance (2DL CA) | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.3.3 4Rx TDD FR1 PDSCH mapping Type A performance of Scell on band with shared spectrum access | SNRs as specified | 1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.3.4.1 4Rx PDSCH Demodulation Performance for HST-SFN CA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.3.5.1 4Rx PDSCH Demodulation Performance for HST-DPS CA | SNRs as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.3A.1.1 2Rx-4Rx Normal PDSCH Demodulation Performance for CA (2DL CA) | SNRs as specified | 2Rx CC:  1.0 dB for 10Hz doppler  4Rx CC:  0.9dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.3A.1.2 2Rx-4Rx Normal PDSCH Demodulation Performance for CA (3DL CA) | SNRs as specified | 2Rx CC:  1.0 dB for 10Hz doppler  4Rx CC:  0.9dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.2A.3A.1.3 2Rx-4Rx Normal PDSCH Demodulation Performance for CA (3DL CA) | SNRs as specified | 2Rx CC:  1.0 dB for 10Hz doppler  4Rx CC:  0.9dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.1.1.1 1Rx FDD FR1 PDCCH performance for RedCap | SNRs as specified | 1.0 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.1.2.1 1Rx TDD FR1 PDCCH performance for RedCap | SNRs as specified | 1.0 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.2.1.1 2Rx FDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.2.1.2 2Rx FDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | SNRs as specified | 1.0 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.2.1.3 2Rx FDD FR1 PDCCH 1 Tx antenna performance for power saving | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.2.1.4 2Rx FDD FR1 PDCCH performance for RedCap | SNRs as specified | 0.9 dB for Test 1  1.0 dB for Test 2 | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.2.1.5 2RX FDD Minimum requirements for PDCCH with intra-slot repetition | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.2.2.1 2Rx TDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.2.2.2 2Rx TDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | SNRs as specified | 1.0 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.2.2.3 2Rx TDD FR1 PDCCH 1 Tx antenna performance for power saving | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.2.2.4 2Rx TDD FR1 PDCCH performance for RedCap | SNRs as specified | 0.8 dB for Test 1  0.9 dB for Test 2 | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.2.2.5 2RX TDD Minimum requirements for PDCCH with intra-slot repetition | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.3.1.1 4Rx FDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.3.1.2 4Rx FDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | SNRs as specified | 1.0 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.3.1.3 4Rx FDD FR1 PDCCH 1 Tx antenna performance power saving | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.3.1.4 4RX FDD Minimum requirements for PDCCH with intra-slot repetition | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.3.2.1 4Rx TDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.3.2.2 4Rx TDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | SNRs as specified | 1.0 dB | Formula: SNR + TT  T-put limit unchanged | |
| 5.3.3.2.4 4RX TDD Minimum requirements for PDCCH with intra-slot repetition | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged | |
| 11.1.2.1.1\_1 2Rx FR1 PSSCH performance - single active PSSCH link | SNR as specified | 0.8 dB | Formula: SNR + TT  T-put limit unchanged | |
| 11.1.3.1.1\_1 2Rx FR1 PSCCH performance - single active PSSCH link | SNR as specified | 0.8 dB | Formula: SNR + TT  missing detection probability limit unchanged | |
| 11.1.5.1.1\_1 2Rx FR1 PSCCH performance - single active PSSCH link | SNR as specified | 0.8 dB | Formula: SNR + TT  missing detection probability limit unchanged | |
| 11.1.6.1.1\_1 2Rx FR1 Power imbalance performance - two active PSSCH link | SNR as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 11.1.7.1.1\_1 2Rx FR1 HARQ buffer soft combining performance - maximum number of HARQ processes | SNR as specified | 0.6 dB | Formula: SNR + TT  T-put limit unchanged | |
| 11.1.8.1.1\_1 2Rx FR1 PSCCH decoding capability - maximum number of received PSCCHs | sidelink power | 0 dB | sidelink power unchanged  missing detection probability limit unchanged | |
| 11.1.9.1.1\_1 2Rx FR1 PSFCH decoding capability - maximum number of received PSFCHs | sidelink power | 0 dB | sidelink power unchanged  missing detection probability limit unchanged | |
| 5.5.1 FR1 Sustained downlink data rate performance for single carrier | Downlink power -112 dBm/Hz | 0 dB | Formula: Downlink power + TT  T-put limit unchanged | |
| 5.5.2 FR1 Sustained downlink data rate performance for single carrier with DL1024QAM | Downlink power -110.46 dBm/Hz | 0 dB | Formula: Downlink power + TT  T-put limit unchanged  Downlink power calculated by replacing EVM value to 2.5% instead of 3% in the formula mentioned in clause 4.4.4.2.1 | |
| 5.5.3 FR1 Sustained downlink data rate performance for RedCap | Downlink power -112 dBm/Hz | 0 dB | Formula: Downlink power + TT  T-put limit unchanged | |
| 5.5A.1.1 FR1 SDR performance for CA (2DL CA) | Same as 5.5.1 | Same as 5.5.1 | Same as 5.5.1 |
| 5.5A.1.2 FR1 SDR performance for CA (3DL CA) | Same as 5.5.1 | Same as 5.5.1 | Same as 5.5.1 |
| 5.5A.1.3 FR1 SDR performance for CA (4DL CA) | Same as 5.5.1 | Same as 5.5.1 | Same as 5.5.1 |
| 5.5A.1.4 FR1 SDR performance for CA (5DL CA) | Same as 5.5.1 | Same as 5.5.1 | Same as 5.5.1 |
| 9.4B.1.1 Sustained downlink data rate performance for EN-DC within FR1 | Downlink power -112 dBm/Hz | 0 dB | Formula: Downlink power + TT  T-put limit unchanged |
| 9.4B.1.1\_1 Sustained downlink data rate performance for EN-DC within FR1 (2 NR CCs) | Same as 9.4B.1.1 | Same as 9.4B.1.1 | Same as 9.4B.1.1 |
| 9.4B.1.1\_2 Sustained downlink data rate performance for EN-DC within FR1 (3 NR CCs) | Same as 9.4B.1.1 | Same as 9.4B.1.1 | Same as 9.4B.1.1 |
| 9.4B.1.1\_3 Sustained downlink data rate performance for EN-DC within FR1 (4 NR CCs) | Same as 9.4B.1.1 | Same as 9.4B.1.1 | Same as 9.4B.1.1 |

### F.1.3.3 Measurement of Channel State Information reporting

The derivation of the test requirements for the test cases in section 6 is defined in Table F.1.3.3-1.

Table F.1.3.3-1: Derivation of Test Requirements (FR1 channel state information reporting tests)

|  |  |  |  |
| --- | --- | --- | --- |
| Test | Minimum Requirement in TS 38.101-4 | Test Tolerance (TT) | Test Requirement in TS 38.521-4 |
| 6.2.1.1.1.1 1Rx FDD FR1 periodic CQI reporting under AWGN conditions for RedCap | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.1.1.2.1 1Rx FDD FR1 periodic wideband CQI reporting under fading conditions for RedCap | SNRs as specified  ** 20%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  *0.01*  BLER 0 | SNR unchanged  ** unchanged  ** 1.04  BLER limit unchanged |
| 6.2.1.2.1.1 1Rx TDD FR1 periodic CQI reporting under AWGN conditions for RedCap | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.2.1.1.1 2Rx FDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.2.1.1.2 2Rx FDD FR1 periodic CQI reporting with Table 3 under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.2.1.1.3 2Rx FDD FR1 periodic CQI reporting with Table 4 under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.2.1.1.4 2Rx FDD FR1 periodic CQI reporting under AWGN conditions for RedCap | SNRs as specified Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.2.1.2.1 2Rx FDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | SNRs as specified  ** 20%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  *0.01*  BLER 0 | SNR unchanged  ** unchanged  ** 1.04  BLER limit unchanged |
| 6.2.2.1.2.2 2Rx FDD FR1 periodic subband CQI reporting under fading conditions for both SA and NSA | SNRs as specified  ** 2%  **55%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  **0%  **0.01  BLER 0 | SNR unchanged  ** limit unchanged  **limit unchanged  ** 1.04  BLER limit unchanged |
| 6.2.2.1.2.4 2Rx FDD FR1 periodic wideband CQI reporting under fading conditions for RedCap | SNRs as specified  ** 20%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  *0.01*  BLER 0 | SNR unchanged  ** unchanged  ** 1.04  BLER limit unchanged |
| 6.2.2.2.1.1 2Rx TDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.2.2.1.2 2Rx TDD FR1 periodic CQI reporting with Table 3 under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.2.2.1.4 2Rx TDD FR1 periodic CQI reporting with Table 4 under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.2.2.1.3 2Rx TDD FR1 CQI reporting for PCell on band with shared spectrum access under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.2.2.1.5 2Rx TDD FR1 periodic CQI reporting under AWGN conditions for RedCap | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.2.2.2.1 2Rx TDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | SNRs as specified  ** 20%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  *0.01*  BLER 0 | SNR unchanged  ** unchanged  ** 1.04  BLER limit unchanged |
| 6.2.2.2.2.2 2Rx TDD FR1 periodic subband CQI reporting under fading conditions for both SA and NSA | SNRs as specified  ** 2%  **55%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  **0%  *0.01*  BLER 0 | SNR unchanged  ** limit unchanged  **limit unchanged  ** 1.04  BLER limit unchanged |
| 6.2.2.2.2.4 2Rx TDD FR1 periodic wideband CQI reporting under fading conditions for RedCap | SNRs as specified  ** 20%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  *0.01*  BLER 0 | SNR unchanged  ** unchanged  ** 1.04  BLER limit unchanged |
| 6.2.3.1.1.1 4Rx FDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.3.1.1.2 4Rx FDD FR1 periodic CQI reporting with Table 3 under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.3.1.1.3 4Rx FDD FR1 periodic CQI reporting with Table 4 under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.3.1.2.1 4Rx FDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | SNRs as specified  ** 5%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  *0.01*  BLER 0 | SNR unchanged  ** unchanged  ** 1.04  BLER limit unchanged |
| 6.2.3.1.2.2 4Rx FDD FR1 aperiodic subband CQI reporting under fading conditions for both SA and NSA | SNRs as specified  ** 2%  **55%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  **0%  **0.01  BLER 0 | SNR unchanged  ** limit unchanged  **limit unchanged  ** 1.04  BLER limit unchanged |
| 6.2.3.2.1.1 4Rx TDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.3.2.1.2 4Rx TDD FR1 periodic CQI reporting with Table 3 under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.3.2.1.4 4Rx TDD FR1 periodic CQI reporting with Table 4 under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.3.2.1.3 4Rx TDD FR1 CQI reporting for PCell on band with shared spectrum access under AWGN conditions for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 6.2.3.2.2.1 4Rx TDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | SNRs as specified  ** 5%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  *0.01*  BLER 0 | SNR unchanged  ** unchanged  ** 1.04  BLER limit unchanged |
| 6.2.3.2.2.2 4Rx TDD FR1 aperiodic subband CQI reporting under fading conditions for both SA and NSA | SNRs as specified  ** 2%  **55%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  **0%  *0.01*  BLER 0 | SNR unchanged  ** limit unchanged  **limit unchanged  ** 1.04  BLER limit unchanged |
| 6.2A.3.1.1 2Rx CQI reporting accuracy under AWGN conditions for CA (2DL CA) | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | Test requirement unchanged |
| 6.2A.3.1.2 2Rx CQI reporting accuracy under AWGN conditions for CA (3DL CA) | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | Test requirement unchanged |
| 6.2A.3.1.3 2Rx CQI reporting accuracy under AWGN conditions for CA (4DL CA) | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | Test requirement unchanged |
| 6.3.1.1.1 1Rx FDD Single PMI with 4TX TypeI-SinglePanel Codebook for RedCap | SNRs as specified  *g* 1.30 | SNR 0 dB  *g 0.01* | SNR unchanged  *g* 1.29 |
| 6.3.1.2.1 1Rx TDD Single PMI with 4TX TypeI-SinglePanel Codebook for RedCap | SNRs as specified  *g* 1.30 | SNR 0 dB  *g 0.01* | SNR unchanged  *g* 1.29 |
| 6.3.2.1.1 2Rx FDD FR1 Single PMI with 4Tx Type I- SinglePanel codebook for both SA and NSA | SNRs as specified  **1.30 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.29 |
| 6.3.2.1.2 2Rx FDD FR1 Single PMI with 8Tx Type I – SinglePanel codebook for both SA and NSA | SNRs as specified  **1.50 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.49 |
| 6.3.2.1.3 2Rx FDD FR1 Multiple PMI with 16Tx Type I – SinglePanel Codebook for both SA and NSA | SNRs as specified  **2.50 | SNR 0 dB  *0.01* | SNR unchanged  ** 2.49 |
| 6.3.2.1.4 2Rx FDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | SNRs as specified  *g* 5.0 | SNR 0 dB  *g 0.01* | SNR unchanged  *g* 4.99 |
| 6.3.2.1.5 2Rx FDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | SNRs as specified  *g* 1.9 | SNR 0 dB  *g 0.01* | SNR unchanged  *g* 1.89 |
| 6.3.2.1.6 2Rx FDD FR1 Multiple PMI with 16Tx Enhanced TypeII codebook for both SA and NSA | SNRs as specified  **2.2 | SNR 0 dB  *0.01* | SNR unchanged  ** 2.19 |
| 6.3.2.1.7 Single PMI with 8 ports TypeI-SinglePanel Codebook for Single-DCI based transmission scheme | SNRs as specified  **1.6 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.59 |
| 6.3.2.2.1 2Rx TDD FR1 Single PMI with 4Tx TypeI - SinglePanel codebook for both SA and NSA | SNRs as specified  **1.30 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.29 |
| 6.3.2.2.2 2Rx TDD FR1 Single PMI with 8Tx TypeI - SinglePanel codebook for both SA and NSA | SNRs as specified  **1.50 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.49 |
| 6.3.2.2.3 2Rx TDD FR1 Single PMI with 16Tx Type1 - SinglePanel codebook for both SA and NSA | SNRs as specified  *2*.50 | SNR 0 dB  *0.01* | SNR unchanged  ** 2.49 |
| 6.3.2.2.4 2Rx TDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | SNRs as specified  *5*.0 | SNR 0 dB  *0.01* | SNR unchanged  ** 4.99 |
| 6.3.2.2.5 2Rx TDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | SNRs as specified  *g* 1.9 | SNR 0 dB  *g 0.01* | SNR unchanged  *g* 1.89 |
| 6.3.2.2.6 2Rx TDD FR1 Multiple PMI with 16Tx Enhanced TypeII codebook for both SA and NSA | SNRs as specified  **2.2 | SNR 0 dB  *0.01* | SNR unchanged  ** 2.19 |
| 6.3.2.2.7 2Rx TDD Single PMI with 4TX TypeI-SinglePanel Codebook for RedCap | SNRs as specified  **1.30 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.29 |
| 6.3.2.2.8 Single PMI with 8 ports TypeI-SinglePanel Codebook for Single-DCI based transmission scheme | SNRs as specified  ** | SNR 0 dB  *0.01* | SNR unchanged  ** 1.59 |
| 6.3.3.1.1 Single PMI with 4TX TypeI-SinglePanel Codebook– SinglePanel codebook for both SA and NSA | SNRs as specified  **1.30 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.29 |
| 6.3.3.1.2 Single PMI with 8TX TypeI-SinglePanel Codebook– SinglePanel codebook for both SA and NSA | SNRs as specified  **1.50 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.49 |
| 6.3.3.1.3 4Rx FDD FR1 Multiple PMI with 16Tx Type I – SinglePanel Codebook for both SA and NSA | SNRs as specified  **3.00 | SNR 0 dB  *0.01* | SNR unchanged  ** 2.99 |
| 6.3.3.1.4 4Rx FDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | SNRs as specified  *g 7*.0 | SNR 0 dB  *g 0.01* | SNR unchanged  *g* 6.99 |
| 6.3.3.1.5 4Rx FDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | SNRs as specified  *g 1.9* | SNR 0 dB  *g 0.01* | SNR unchanged  *g* 1.89 |
| 6.3.3.1.6 4Rx FDD FR1 Multiple PMI with 16Tx Enhanced TypeII codebook for both SA and NSA | SNRs as specified  **2.2 | SNR 0 dB  *0.01* | SNR unchanged  ** 2.19 |
| 6.3.3.1.7 Single PMI with 8 ports TypeI-SinglePanel Codebook for Single-DCI based transmission scheme | SNRs as specified  **1.6 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.59 |
| 6.3.3.2.1 4Rx TDD FR1 Single PMI with 4Tx Type1 - SinglePanel codebook for both SA and NSA | SNRs as specified  **1.30 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.29 |
| 6.3.3.2.2 4Rx TDD FR1 Single PMI with 8Tx Type1 - SinglePanel codebook for both SA and NSA | SNRs as specified  **1.50 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.49 |
| 6.3.3.2.3 4Rx TDD FR1 Single PMI with 16Tx Type1 - SinglePanel codebook for both SA and NSA | SNRs as specified  *3*.0 | SNR 0 dB  *0.01* | SNR unchanged  ** 2.99 |
| 6.3.3.2.4 4Rx TDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | SNRs as specified  *g 7*.0 | SNR 0 dB  *g 0.01* | SNR unchanged  *g* 6.99 |
| 6.3.3.2.5 4Rx TDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | SNRs as specified  *g* 1.8 | SNR 0 dB  *g 0.01* | SNR unchanged  *g* 1.79 |
| 6.3.3.2.6 4Rx TDD FR1 Multiple PMI with 16Tx Enhanced TypeII codebook for both SA and NSA | SNRs as specified  **2.2 | SNR 0 dB  *0.01* | SNR unchanged  ** 2.19 |
| 6.3.3.2.7 Single PMI with 8 ports TypeI-SinglePanel Codebook for Single-DCI based transmission scheme | SNRs as specified  **1.6 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.59 |
| 6.4.2.1\_1 2Rx FDD FR1 RI reporting for both SA and NSA | SNRs as specified  **1.00 for Test 1  **1.05 for Test 2  **0.90 for Test 3 | SNR 0 dB  *0.01 for Test 1*  *0.01 for Test 2*  *0.01 for Test 3* | SNR unchanged  ** 0.99 for Test 1  ** 1.04 for Test 2  ** 0.89 for Test 3 |
| 6.4.2.1.1 2Rx FDD FR1 RI reporting for RedCap | SNRs as specified  **1.05 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.04 |
| 6.4.2.2\_1 2Rx TDD FR1 RI reporting for both SA and NSA | SNRs as specified  **1.00 for Test 1  **1.05 for Test 2  **0.90 for Test 3 | SNR 0 dB  *0.01 for Test 1*  *0.01 for Test 2*  *0.01 for Test 3* | SNR unchanged  ** 0.99 for Test 1  ** 1.04 for Test 2  ** 0.89 for Test 3 |
| 6.4.2.2.1 2Rx TDD FR1 RI reporting for RedCap | SNRs as specified  **1.05 | SNR 0 dB  *0.01* | SNR unchanged  ** 1.04 |
| 6.4.3.1\_1 4Rx FDD FR1 RI reporting for both SA and NSA | SNRs as specified  **0.90 for Test 1  **1.05 for Test 2  **0.90 for Test 3  **0.90 for Test 4 | SNR 0 dB  *0.01 for Test 1*  *0.01 for Test 2*  *0.01 for Test 3*  *0.01 for Test 4* | SNR unchanged  ** 0.89 for Test 1  ** 1.04 for Test 2  ** 0.89 for Test 3  ** 0.89 for Test 4 |
| 6.4.3.2\_1 4Rx TDD FR1 RI reporting for both SA and NSA | SNRs as specified  **0.90 for Test 1  **1.05 for Test 2  **0.90 for Test 3  **0.90 for Test 4 | SNR 0 dB  *0.01 for Test 1*  *0.01 for Test 2*  *0.01 for Test 3*  *0.01 for Test 4* | SNR unchanged  ** 0.89 for Test 1 as per Table G.3.4  ** 1.04 for Test 2 as per Table G.3.4  ** 0.89 for Test 3 as per Table G.3.4  ** 0.89 for Test 4 as per Table G.3.4 |

# F.2 Measurement uncertainties and test tolerances for FR2

## F.2.1 Acceptable uncertainty of test system (normative)

The maximum acceptable uncertainty of the Test System is specified below for each test, where appropriate. The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified range, and the equipment under test to be measured with an uncertainty not exceeding the specified values. Care should be taken to ensure that each conformance test implementation including the OTA chamber aspects meets the specified measurement uncertainty for each test case by requiring the test laboratory to maintain a detailed measurement uncertainty test report showing compliance to all the measurement uncertainty requirements. The detailed measurement uncertainty report would contain the justification for each measurement uncertainty component and its value and distribution. The derivation of these values is based on the minimum conformance requirements plus relaxation, i.e., test tolerance is not to be considered. All ranges and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95 % is the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment.

The downlink signal uncertainties apply at the defined quiet zone with the UE properly positioned in the quiet zone. The uplink signal uncertainties apply at the measurement equipment with the UE positioned properly in the quiet zone.

### F.2.1.1 Measurement of test environments

TBD

### F.2.1.2 Measurement of Demod Performance requirements

This clause defines the maximum test system uncertainty for Demod Performance requirements. The maximum test system uncertainty allowed for the measurement uncertainty contributors are defined in Table F.2.1.2-1.

Table F.2.1.2-1: Maximum measurement uncertainty values for the test system for FR2 (up to 40 GHz) and Channel BW ≤ 400 MHz

| MU contributor | | | Unit | Value | | Comment | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| AWGN flatness and signal flatness, max deviation for any Resource Block, relative to average over BWconfig | | | dB | ±3.6 | |  | |
| gNB emulator Signal to noise ratio uncertainty | | | dB | ±0.3 | |  | |
| Impact on non-ideal isolation between branches for the wireless cable mode | | dB | 0.60 for Rank1  0.45 for Rank2 | | | Systematic uncertainty | |
| Fading profile power uncertainty | | | dB | ±0.5 for 1Tx  ±0.7 for 2Tx | |  | |
| SNR uncertainty due to finite test time | | | dB | ±0.3 for PDSCH and doppler < 100Hz  0.0 for PDSCH and doppler ≥  ±0.4 for PDCCH | |  | |

The maximum test system uncertainty for test cases defined in section 7 is defined in Table F.2.1.2-2.

Table F.2.1.2-2: Maximum test system uncertainty for FR2 demodulation performance test cases

|  |  |  |
| --- | --- | --- |
| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
| 7.2.2.2.1\_1 2Rx TDD FR2 PDSCH mapping Type A performance - 2x2 MIMO with baseline receiver for SA and NSA | 2Tx, Rank 1:  ± 1.82 dB for Doppler < 100 Hz  ± 1.78 dB for Doppler ≥100 Hz  2Tx, Rank 2:  ± 1.67 dB for Doppler < 100Hz  ± 1.63 dB for Doppler ≥100 Hz | Overall system uncertainty for fading conditions comprises four quantities:  1. gNB emulator Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  4. SNR uncertainty due to finite test time  5. Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator SNR  Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (gNB emulator Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2  ) + Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB  AWGN flatness and signal flatness ±3.6 dB  SNR uncertainty due to finite test time ±0.3 dB for doppler < 100Hz, otherwise 0 dB  Impact on non-ideal isolation between branches for the wireless cable mode 0.60 dB for Rank1, 0.45 dB for Rank2 |
| 7.2.2.2.1\_2 2Rx TDD FR2 PDSCH mapping Type A performance - 2x2 MIMO with enhanced type 1 receiver for SA and NSA | 2Tx, Rank 2:  ± 1.67 dB for Doppler < 100Hz  ± 1.63 dB for Doppler ≥ 100Hz | Same as 7.2.2.2.1\_1 |
| 7.2.2.2.1\_3 2Rx TDD FR2 PDSCH mapping Type A performance - 2x2 MIMO with 256QAM for SA and NSA (Rel-16 and forward) | 2Tx, Rank 1:  ± 1.82 dB for Doppler < 100 Hz | Same as 7.2.2.2.1\_1 |
| 7.2.2.2.2\_1 2Rx TDD FR2 PDSCH repetitions over multiple slots | 2Tx, Rank 1:  ± 1.81 dB | Overall system uncertainty for fading conditions comprises four quantities:  1. gNB emulator Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  4. SNR uncertainty due to finite test time  5. Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator SNR  Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (gNB emulator Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2) + Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for 2Tx  AWGN flatness and signal flatness ±3.6 dB  SNR uncertainty due to finite test time ±0.25 dB for 1% residual BLER  Impact on non-ideal isolation between branches for the wireless cable mode 0.60 dB for Rank1 |
| 7.2.2.2.3\_1 2Rx TDD FR2 PDSCH Mapping Type B | 2Tx, Rank 1:  ± 1.82 dB for Doppler < 100 Hz | Same as 7.2.2.2.1\_1 |
| 7.2A.2.1 2Rx TDD FR2 CA requirements for normal PDSCH Demodulation Performance for both SA and NSA (2DLCA) | 2Tx, Rank 2:  ± 1.67 dB for Doppler < 100Hz | Overall system uncertainty for fading conditions comprises four quantities:  1. gNB emulator Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  4. SNR uncertainty due to finite test time  5. Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator SNR  Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (gNB emulator Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2  ) + Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB  AWGN flatness and signal flatness ±3.6 dB  SNR uncertainty due to finite test time ±0.3 dB for doppler < 100Hz, otherwise 0 dB  Impact on non-ideal isolation between branches for the wireless cable mode 0.45 dB for Rank2 |
| 7.2A.2.2 2Rx TDD FR2 CA requirements for normal PDSCH Demodulation Performance for both SA and NSA (3DLCA) | Same as 7.2A.2.1 | Same as 7.2A.2.1 |
| 7.3.2.2.1 2Rx TDD FR2 PDCCH 1 Tx antenna performance for both SA and NSA | 1Tx, rank1:  ± 1.74 dB | Overall system uncertainty for fading conditions comprises four quantities:  1. gNB emulator Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  4. SNR uncertainty due to finite test time  5. Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator SNR  Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (gNB emulator Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2  ) + Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.5 dB for 1Tx, ±0.7 dB for 2Tx  AWGN flatness and signal flatness ±3.6 dB  SNR uncertainty due to finite test time ±0.4 dB  Impact on non-ideal isolation between branches for the wireless cable mode 0.6 for Rank1 and 0.45 for rank2 |
| 7.3.2.2.2 2Rx TDD FR2 PDCCH 2 Tx antenna performance for both SA and NSA | 2Tx, rank1:  ± 1.84 dB | Same as 7.3.2.2.1 |
| 7.3.2.2.3 2Rx TDD FR2 PDCCH 1 Tx antenna performance for power saving | 1Tx, rank1:  ± 1.74 dB | Same as 7.3.2.2.1 |
| 7.5.1 FR2 Sustained downlink data rate performance for single carrier | Downlink absolute power uncertainty (including beam peak search , averaged over BWConfig ± 5.19 dB | Downlink absolute power uncertainty (including beam peak search error) is one of the factors used to determine the max testable SNR for a given Test System as listed in sheet “Mode2 100MHz” in 38.521-4 Spreadsheet - Demod SNR range calculator V3.xlsx of TR 38.903 |
| 7.5.2 FR2 Sustained downlink data rate performance for RedCap | Same as 7.5.1 | Same as 7.5.1 |
| 7.5A.1.1 FR2 SDR performance for CA (2DL CA) | Maximum aggregated BW 400MHz, same as 7.5.1  Maximum aggregated BW > 400MHz, TBD | Same as 7.5.1 |
| 7.5A.1.2 FR2 SDR performance for CA (3DL CA) | Same as 7.5A.1.1 | Same as 7.5A.1.1 |
| 7.5A.1.3 FR2 SDR performance for CA (4DL CA) | Same as 7.5A.1.1 | Same as 7.5A.1.1 |
| 7.5A.1.4 FR2 SDR performance for CA (5DL CA) | Same as 7.5A.1.1 | Same as 7.5A.1.1 |
| 7.5A.1.5 FR2 SDR performance for CA (6DL CA) | Same as 7.5A.1.1 | Same as 7.5A.1.1 |
| 7.5A.1.6 FR2 SDR performance for CA (7DL CA) | Same as 7.5A.1.1 | Same as 7.5A.1.1 |
| 7.5A.1.7 FR2 SDR performance for CA (8DL CA) | Same as 7.5A.1.1 | Same as 7.5A.1.1 |
| 9.4B.1.2 Sustained downlink data rate performance for EN-DC including FR2 NR carrier | Downlink absolute power uncertainty (including beam peak search , averaged over BWConfig ± 5.19 dB | Downlink absolute power uncertainty (including beam peak search error) is one of the factors used to determine the max testable SNR for a given Test System as listed in sheet “Mode2 100MHz” in 38.521-4 Spreadsheet - Demod SNR range calculator V3.xlsx of TR 38.903 |
| 9.4B.1.2\_1 Sustained downlink data rate performance for EN-DC including FR2 (2 NR CCs) | Same as 9.4B.1.2 | Downlink absolute power uncertainty (including beam peak search error) is one of the factors used to determine the max testable SNR for a given Test System as listed in Demod SNR range calculator.xlsx of TR 38.903 |
| 9.4B.1.2\_2 Sustained downlink data rate performance for EN-DC including FR2 (3 NR CCs) | Same as 9.4B.1.2 | Same as 9.4B.1.2 |
| 9.4B.1.2\_3 Sustained downlink data rate performance for EN-DC including FR2 (4 NR CCs) | Same as 9.4B.1.2 | Same as 9.4B.1.2 |

### F.2.1.3 Measurement of Channel State Information reporting

This clause defines the maximum test system uncertainty for channel state information reporting requirements. The maximum test system uncertainty allowed for the measurement uncertainty contributors are defined in Table F.2.1.3-1.

Table F.2.1.3-1: Maximum measurement uncertainty values for the test system for FR2 (up to 40 GHz) and Channel BW ≤ 400 MHz

| MU contributor | | | Unit | Value | | Comment | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| AWGN flatness and signal flatness, max deviation for any Resource Block, relative to average over BWconfig | | | dB | Same as in table F.2.1.2-1 | |  | |
| Signal to noise ratio uncertainty | | | dB | Same as in table F.2.1.2-1 | |  | |
| Impact on non-ideal isolation between branches for the wireless cable mode | | dB | Same as in table F.2.1.2-1 | | |  | |
| Fading profile power uncertainty | | | dB | Same as in table F.2.1.2-1 | |  | |

The maximum test system uncertainty for test cases defined in section 8 is defined in Table F.2.1.3-2.

Table F.2.1.3-2: Maximum test system uncertainty for FR2 channel state information reporting test cases

|  |  |  |
| --- | --- | --- |
| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
| 8.2.2.2.1.1 2 Rx TDD FR2 periodic wideband CQI reporting under AWGN performance for both SA and NSA | ± 1.40 dB | Overall system uncertainty under AWGN conditions comprises three quantities:  1. gNB emulator Signal-to-noise ratio uncertainty  2. Effect of AWGN flatness and signal flatness  3. Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator SNR  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x [0.25] effect on the required SNR, so use sensitivity factor of x [0.25] for the uncertainty contribution.  Test System uncertainty = SQRT (gNB emulator Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 ) + Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator Signal-to-noise ratio uncertainty ±0.3 dB  AWGN flatness and signal flatness ±3.6 dB  Impact on non-ideal isolation between branches for the wireless cable mode 0.45 dB for Rank2 and 0.6 for Rank1 |
| 8.2.2.2.2.1 2 Rx TDD FR2 aperiodic wideband CQI reporting under fading performance for both SA and NSA | ± 1.82 dB for Doppler < 100Hz | Overall system uncertainty for fading conditions comprises five quantities:  1. gNB emulator Signal-to-noise ratio uncertainty  2. Fading profile power uncertainty  3. Effect of AWGN flatness and signal flatness  4. SNR uncertainty due to finite test time  5. Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator SNR  Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:  AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.  Test System uncertainty = SQRT (gNB emulator Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2 + SNR uncertainty due to finite test time2  ) + Impact on non-ideal isolation between branches for the wireless cable mode  gNB emulator Signal-to-noise ratio uncertainty ±0.3 dB  Fading profile power uncertainty ±0.7 dB for 2Tx  AWGN flatness and signal flatness ±3.6 dB  SNR uncertainty due to finite test time ±0.3 dB  Impact on non-ideal isolation between branches for the wireless cable mode 0.6 for Rank1 and 0.45 for Rank2 |
| 8.2.2.2.2.1\_1 2Rx TDD FR2 aperiodic wideband CQI reporting under fading performance for both SA and NSA – 256QAM (Rel-16 and forward) | Same as 8.2.2.2.2.1 | Same as 8.2.2.2.2.1 |
| 8.2A.3.1.1 2Rx CQI reporting accuracy under AWGN conditions for CA (2DL CA) | Same as 8.2.2.2.1.1 on each CC. | Same as 8.2.2.2.1.1 |
| 8.2A.3.1.2 2Rx CQI reporting accuracy under AWGN conditions for CA (3DL CA) | Same as 8.2.2.2.1.1 on each CC. | Same as 8.2.2.2.1.1 |
| 8.2A.3.1.3 2Rx CQI reporting accuracy under AWGN conditions for CA (4DL CA) | Same as 8.2.2.2.1.1 on each CC. | Same as 8.2.2.2.1.1 |
| 8.3.2.2.1 2Rx TDD FR2 Single PMI with 2TX TypeI-SinglePanel codebook for both SA and NSA | Same as 8.2.2.2.2.1 | Same as 8.2.2.2.2.1 |
| 8.4.2.2.1 2Rx TDD FR2 RI reporting for both SA and NSA | Same as 8.2.2.2.2.1 | Same as 8.2.2.2.2.1 |

## F.2.2 Interpretation of measurement results (normative)

The actual measurement uncertainty of the Test System for the measurement of each parameter shall be included in the test report.

The recorded value for the Test System uncertainty shall be, for each measurement, equal to or lower than the appropriate figure in clause F.1 of the present document.

If the Test System using one of the permitted test methods defined in TR38.903 [20] for a test is known to have a measurement uncertainty greater than that specified in clause F.1, it is still permitted to use this apparatus provided that an adjustment is made value as follows:

Any additional uncertainty in the Test System over and above that specified in clause F.1 shall be used to tighten the Test Requirement, making the test harder to pass. For some tests, for example receiver tests, this may require modification of stimulus signals. This procedure will ensure that a Test System not compliant with clause F.1does not increase the chance of passing a device under test where that device would otherwise have failed the test if a Test System compliant with clause F.1 had been used.

## F.2.3 Test Tolerance and Derivation of Test Requirements (informative)

TBD

### F.2.3.1 Measurement of test environments

TBD

### F.2.3.2 Measurement of Demod Performance requirements

The derivation of the test requirements for the test cases in section 7 is defined in Table F.2.3.2-1.

Table F.2.3.2-1: Derivation of Test Requirements (FR2 demodulation performance tests)

|  |  |  |  |
| --- | --- | --- | --- |
| Test | Minimum Requirement in TS 38.101-4 | Test Tolerance (TT) | Test Requirement in TS 38.521-4 |
| 7.2.2.2.1\_1 2Rx TDD FR2 PDSCH mapping Type A performance - 2x2 MIMO with baseline receiver for SA and NSA | SNRs as specified | 2Tx, Rank 1:  1.8 dB  2Tx, Rank 2:  1.7 dB for doppler < 100Hz  1.6 dB otherwise | Formula: SNR + TT  T-put limit unchanged |
| 7.2.2.2.1\_2 2Rx TDD FR2 PDSCH mapping Type A performance - 2x2 MIMO with enhanced type 1 receiver for SA and NSA | SNRs as specified | 2Tx, Rank 2:  1.7 dB for doppler < 100Hz  1.6 dB otherwise | Formula: SNR + TT  T-put limit unchanged |
| 7.2.2.2.1\_3 2Rx TDD FR2 PDSCH mapping Type A performance - 2x2 MIMO with 256QAM for SA and NSA (Rel-16 and forward) | SNRs as specified | 2Tx, Rank 1:  1.8 dB | Formula: SNR + TT  T-put limit unchanged |
| 7.2.2.2.2\_1 2Rx TDD FR2 PDSCH repetitions over multiple slots | SNRs as specified | 2Tx, Rank 1:  1.8 dB | Formula: SNR + TT  T-put limit unchanged |
| 7.2.2.2.3\_1 2Rx TDD FR2 PDSCH Mapping Type B | SNRs as specified | 2Tx, Rank 1:  1.8 dB | T-put limit unchanged |
| 7.2A.2.1 2Rx TDD FR2 CA requirements for normal PDSCH Demodulation Performance for both SA and NSA (2DLCA) | SNRs as specified | 2Tx, Rank 2:  1.7 dB | Formula: SNR + TT  T-put limit unchanged |
| 7.2A.2.2 2Rx TDD FR2 CA requirements for normal PDSCH Demodulation Performance for both SA and NSA (3DLCA) | Same as 7.2A.2.1 | Same as 7.2A.2.1 | Same as 7.2A.2.1 |
| 7.3.2.2.1 2Rx TDD FR2 PDCCH 1 Tx antenna performance for both SA and NSA | SNRs as specified | 1Tx, rank1:  1.7 dB | Formula: SNR + TT  T-put limit unchanged |
| 7.3.2.2.2 2Rx TDD FR2 PDCCH 2 Tx antenna performance for both SA and NSA | SNRs as specified | 2Tx, rank1:  1.8 dB | Formula: SNR + TT  T-put limit unchanged |
| 7.3.2.2.3 2Rx TDD FR2 PDCCH 1 Tx antenna performance for power saving | SNRs as specified | 1Tx, rank1:  1.7 dB | Formula: SNR + TT  T-put limit unchanged |
| 7.5.1 FR2 Sustained downlink data rate performance for single carrier | Power level as applied in the test procedure | No test tolerance applied | T-put limit unchanged |
| 7.5.2 FR2 Sustained downlink data rate performance for RedCap | Same as 7.5.1 | Same as 7.5.1 | Same as 7.5.1 |
| 7.5A.1.1 FR2 SDR performance for CA (2DL CA) | Same as 7.5.1 | Same as 7.5.1 | Same as 7.5.1 |
| 7.5A.1.2 FR2 SDR performance for CA (3DL CA) | Same as 7.5.1 | Same as 7.5.1 | Same as 7.5.1 |
| 7.5A.1.3 FR2 SDR performance for CA (4DL CA) | Same as 7.5.1 | Same as 7.5.1 | Same as 7.5.1 |
| 7.5A.1.4 FR2 SDR performance for CA (5DL CA) | Same as 7.5.1 | Same as 7.5.1 | Same as 7.5.1 |
| 7.5A.1.5 FR2 SDR performance for CA (6DL CA) | Same as 7.5.1 | Same as 7.5.1 | Same as 7.5.1 |
| 7.5A.1.6 FR2 SDR performance for CA (7DL CA) | Same as 7.5.1 | Same as 7.5.1 | Same as 7.5.1 |
| 7.5A.1.7 FR2 SDR performance for CA (8DL CA) | Same as 7.5.1 | Same as 7.5.1 | Same as 7.5.1 |
| 9.4B.1.2 Sustained downlink data rate performance for EN-DC including FR2 NR carrier | Indirect far field (IFF) with 30cm QZ, PC3, 100MHz CHBW  Downlink power  n257, n261: -79.5 dBm/120 kHz  n258: -79.2 dBm/120 kHz | No test tolerance applied | T-put limit unchanged |

### F.2.3.3 Measurement of Channel State Information reporting

The derivation of the test requirements for the test cases in section 8 is defined in Table F.2.3.3-1.

Table F.2.3.3-1: Derivation of Test Requirements (FR2 channel state information reporting tests)

|  |  |  |  |
| --- | --- | --- | --- |
| Test | Minimum Requirement in TS 38.101-4 | Test Tolerance (TT) | Test Requirement in TS 38.521-4 |
| 8.2.2.2.1.1 2 Rx TDD FR2 periodic wideband CQI reporting under AWGN performance for both SA and NSA | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| 8.2.2.2.2.1 2 Rx TDD FR2 aperiodic wideband CQI reporting under fading performance for both SA and NSA | SNRs as specified  ** 2%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  *0.01*  BLER 0 | SNR unchanged  ** unchanged  ** 1.04  BLER limit unchanged |
| 8.2.2.2.2.1\_1 2Rx TDD FR2 aperiodic wideband CQI reporting under fading performance for both SA and NSA | SNRs as specified  ** 2%  **1.05  BLER 0.02 | SNR 0 dB  ** 0%  *0.01*  BLER 0 | SNR unchanged  ** unchanged  ** 1.04  BLER limit unchanged |
| 8.2A.3.1.1 2Rx CQI reporting accuracy under AWGN conditions for CA (2DL CA) | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | Test requirement unchanged |
| 8.2A.3.1.2 2Rx CQI reporting accuracy under AWGN conditions for CA (3DL CA) | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | Test requirement unchanged |
| 8.2A.3.1.3 2Rx CQI reporting accuracy under AWGN conditions for CA (4DL CA) | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | Test requirement unchanged |
| 8.3.2.2.1 2Rx TDD FR2 Single PMI with 2TX TypeI-SinglePanel codebook for both SA and NSA | SNRs as specified  **1.05 for Test 1  **1.05 for Test 2 | SNR 0 dB  *0.01 for Test 1*  *0.01 for Test 2* | SNR unchanged  ** 1.04 for Test 1  ** 1.04 for Test 2 |
| 8.4.2.2.1 2Rx TDD FR2 RI reporting for both SA and NSA | SNRs as specified  **1.00 for Test 1  **1.05 for Test 2  **1.05 for Test 3 | SNR 0 dB  *0.01 for Test 1*  *0.01 for Test 2*  *0.01 for Test 3* | SNR unchanged  ** 0.99 for Test 1  ** 1.04 for Test 2  ** 1.04 for Test 3 |

Annex G (normative):  
Statistical Testing

# G.1 Statistical testing of Performance Requirements with throughput

## G.1.1 General

The test of receiver performance characteristics is twofold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.

2. The ability of the receiver to demodulate /decode this signal is verified by measuring the throughput.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for most receiver performance tests is either 70 % or 30 % of the maximum throughput.

All receiver performance tests are performed in fading conditions. In addition to the statistical considerations, this requires the definition of a minimum test time.

## G.1.2 Mapping throughput to error ratio

a) The measured information bit throughput R is defined as the sum (in kilobits) of the information bit payloads successfully received during the test interval, divided by the duration of the test interval (in seconds).

b) In measurement practice the UE indicates successfully received information bit payload by signalling an ACK to the SS.  
If payload is received, but damaged and cannot be decoded, the UE signals a NACK.

c) Only the ACK and NACK signals, not the data bits received, are accessible to the SS.  
The number of bits is known in the SS from knowledge of what payload was sent.

d) For the reference measurement channel, applied for testing, the number of bits is different in different slots, however in a radio frame it is fixed during one test.

e) The time in the measurement interval is composed of successfully received slots (ACK), unsuccessfully received slots (NACK) and no reception at all (DTX-slots).

f) DTX-slots may occur regularly according the applicable reference measurement channel (regDTX).  
In real live networks this is the time when other UEs are served. In TDD these are the UL and special slots.  
regDTX vary from test to test but are fixed within the test.

g) Additional DTX-slots occur statistically when the UE is not responding ACK or NACK where it should. (statDTX)  
This may happen when the UE was not expecting data or decided that the data were not intended for it.

The pass / fail decision is done by observing the:

- number of NACKs

- number of ACKs and

- number of statDTXs (regDTX is implicitly known to the SS)

The ratio (NACK + statDTX)/(NACK+ statDTX + ACK)is the Error Ratio (ER). Taking into account the time consumed by the ACK, NACK, and DTX-TTIs (regular and statistical), ER can be mapped unambiguously to throughput for any single reference measurement channel test.

## G.1.3 Design of the test

The test is defined by the following design principles (see clause G.2, Theory):

1. The standard concept is applied. (not the early decision concept)

2. A second limit is introduced: The second limit is different, whether 30 % or 70 % throughput is tested.

3. To decide the test pass:

Supplier risk is applied based on the Bad DUT quality

To decide the test fail:

Customer Risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1a) Limit Error Ratio = 0.3 (in case 70 % Throughput is tested) or

1b) Limit Throughput = 0.3 (in case 30 % Throughput is tested) or

1c) Limit Error Ratio = 0.01 (in case 1% BLER is tested)

2a) Bad DUT factor M=1.378 (selectivity)

2b) Bad DUT factor m=0.692 (selectivity)

2c) Bad DUT facor M=1.5 (selectivity)

justification see: TS 34.121 Clause F.6.3.3

3) Confidence level CL = 95 % (for specified DUT and Bad DUT-quality)

## G.1.4 Pass Fail limit

Testing Throughput = 30 %, then the test limit is

Number of successes (ACK) / number of samples ≥ 59 / 233

Testing Throughput = 70 % then the test limit is

Number of fails (NACK and statDTX) / number of samples ≤ 66 / 184

Testing BLER = 1% then the test limit is

Number of fails (NACK and statDTX) / number of samples ≤ 163 / 13135

There are 3 distinct cases:

a) The duration for the number of samples (233, 184 or 13135) is greater than the minimum test time:

Then the number of samples (233, 184 or 13135) is predefined and the decision is done according to the number of events (59 successes, 66 fails or 163 fails)

b) Since subframe 0 and 5 contain less bits than the remaining subframes, it is allowed to predefine a number of samples contained in an integer number of frames. In this case test-limit-ratio applies.

c) The minimum test time is greater than the duration for the number of samples:

The minimum test time is predefined and the decision is done comparing the measured ratio at that instant against the test-limit-ratio.

NOTE: The test time for most of the tests is governed by the Minimum Test Time.

## G.1.5 Minimum Test time

If a pass fail decision in clause G.1.4 can be achieved earlier than the minimum test time, then the test shall not be decided, but continued until the minimum test time is elapsed.

The tables below contain the minimum number of slots for FDD and TDD.

By simulations the minimum number of active subframes (carrying DL payload) was derived (MNAS), then adding inactive subframes to the active ones. (for TDD additional subframes contain no DL payload), then rounding up to full thousand.

Simulation method to derive minimum test time:

With a level, corresponding a throughput at the test limit (here 30 % or 70 % of the max. throughput) the preliminary throughput versus time converges towards the final throughput. The allowance of ± 2% throughput variation around the above mentioned level is predefined by RAN5 to find the minimum test time. The allowance of ± 2% maps through the function "final throughput versus level" into a throughput corridor. The minimum test time is achieved when the preliminary throughput escapes the corridor the last time. The two functions "final throughput versus level" and "preliminary throughput versus time" are simulation results, which are done individual for each demodulation scenario.

In the case where the throughput does not converge across all the seeds used in the simulation within a reasonable time duration, then the throughput corridor is expanded to +/- 3.5% of the target throughput to see if the all the seeds converge. In order to account for the additional throughput variation, a SNR uncertainty due to finite test time term is added to the overall MU calculation.

The entire procedure is summarized as below.

### G.1.5.0\_1 Minimum Test Time procedure for PDSCH scenarios with 30% or 70% Throughput requirement

1. Run the PDSCH simulations for an extended period of time at the SNR of interest for multiple seeds.

2. The minimum test time is determined by the time it took the throughput curve to settle within +/- 2% of the target throughput value across all seeds.

3. If the throughput does not settle within the +/- 2% throughput limit within a reasonable amount of time for any seed, expand the threshold to +/- 3.5% of the target throughput value.

4. To account for the additional 1.5% throughput variation, determine from the Throughput vs SNR curve, what is the SNR delta corresponding to this 1.5 % throughput increase.

5. That SNR value is the added SNR uncertainty due to finite test time.

### G.1.5.0\_2 Minimum Test Time procedure for PDSCH and PDCCH scenarios with 1% BLER requirement

1. Run the PDSCH simulations for an extended period of time at the SNR of interest for multiple seeds.
2. The minimum test time is determined by the time it took the residual BLER curve to converge within +/- 10% of the target 1% residual BLER (i.e within 0.9% and 1.1% BLER) across all seeds.
3. If the residual BLER does not converge within the +/- 10% of the 1% target limit within a reasonable amount of time for any seed, increase SNR in steps of 0.1 dB and rerun the simulations within the same target BLER limit.
4. The additional delta SNR required to meet the residual BLER convergence limit is the added SNR uncertainty due to finite test time.
5. This SNR uncertainty due to finite test time would be one of the MU term in the overall MU calculation

Figure G.1.5-1: Simulation method to derive minimum test time

Table G.1.5-1: Minimum Test time for PDSCH demodulation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TDD UL-DL pattern | | | Reference Channel | | | Propagation condition | | | Demodulation scenario (doppler speed) | | | Minimum number of active subframes (MNAS) | | | MNAS to MNS Scaling factor (Note 3) | | | Minimum Number of Subframes  (MNS) after rounding up to nearest thousand  MNS= | | |
| NA | | | R.PDSCH.1-8.1 FDD | | | HST-750 | | | 750 Hz | | | 6000 (Note 1) | | | 1.0526 | | | 6400 | | |
| NA | | | R.PDSCH.1-8.2 FDD | | | HST-972 | | | 972 Hz | | | 6000 (Note 1) | | | 1.0526 | | | 6400 | | |
| NA | | | R.PDSCH.1-8.1 FDD | | | TDLC300-600 | | | 600 Hz | | | 8000 (Note 1) | | | 1.0526 | | | 9000 | | |
| NA | | | R.PDSCH.1-1.1 FDD | | | TDLB100-400 | | | 400 Hz | | | 10000 (Note 1) | | | 1.0526 | | | 11000 | | |
| NA | | | R.PDSCH.1-1.1 HD-FDD | | | TDLB100-400 | | | 400 Hz | | | 10000 (Note 1) | | | 1.3333 | | | 14000 | | |
| NA | | | R.PDSCH.1-1.2 FDD, R.PDSCH.1-2.1 FDD, R.PDSCH.1-5.1 FDD,  R.PDSCH.5-1.1 FDD | | | TDLC300-100 | | | 100 Hz | | | 20000 (Note 1) | | | 1.0526 | | | 22000 | | |
| NA | | | R.PDSCH.1-1.2 HD-FDD | | | TDLC300-100 | | | 100 Hz | | | 20000 (Note 1) | | | 1.3333 | | | 27000 | | |
| NA | | | R.PDSCH.1-1.3 FDD, R.PDSCH.1-2.2 FDD, R.PDSCH.1-2.3 FDD, R.PDSCH.1-2.4 FDD, R.PDSCH.1-2.5 FDD, R.PDSCH.1-3.1 FDD, R.PDSCH.1-3.2 FDD, R.PDSCH.1-3.3 FDD, R.PDSCH.1-3.4 FDD, R.PDSCH.1-4.1 FDD,  R.PDSCH.1-4.2 FDD,  R.PDSCH.1-12.1 FDD, R.PDSCH.2-1.1 FDD,  R.PDSCH.5-1.2 FDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 1) | | | 1.0526 | | | 79000 | | |
| NA | | | R.PDSCH.1-1.3 HD-FDD,  R.PDSCH.1-1.4 HD-FDD,  R.PDSCH.1-1.5 HD-FDD,  R.PDSCH.1-2.1 HD-FDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 1) | | | 1.3333 | | | 100000 | | |
| NA | | | R.PDSCH.1-7.1 FDD, R.PDSCH.1-7.2 FDD  R.PDSCH.1-18.1 FDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 1) | | | 1.25 | | | 94000 | | |
| NA | | | R.PDSCH.1-17.1 FDD | | | TDLD30-5 | | | 5 Hz | | | 70000 (Note 1) | | | 1.0526 | | | 74000 | | |
| NA | | | R.PDSCH.1-8.3 FDD,  R.PDSCH.1-13.1 FDD,  R.PDSCH.1-13.2 FDD,  R.PDSCH.1-13.3 FDD,  R.PDSCH.1-13.4 FDD,  R.PDSCH.1-13.5 FDD,  R.PDSCH.1-14.1 FDD,  R.PDSCH.1-14.2 FDD,  R.PDSCH.1-14.3 FDD,  R.PDSCH.1-14.4 FDD | | | HST-SFN | | | 870 Hz | | | 30000 (Note 1) | | | 1.0526 | | | 32000 | | |
| NA | | | R.PDSCH.1-8.5 FDD | | | HST-SFN Scheme A  HST-SFN Scheme B | | | 870 Hz | | | [30000 (Note 1)] | | | 1.0526 | | | [32000] | | |
| NA | | | R.PDSCH.1-8.4 FDD,  R.PDSCH.1-15.1 FDD,  R.PDSCH.1-15.2 FDD,  R.PDSCH.1-15.3 FDD,  R.PDSCH.1-15.4 FDD,  R.PDSCH.1-15.5 FDD,  R.PDSCH.1-16.1 FDD,  R.PDSCH.1-16.2 FDD,  R.PDSCH.1-16.3 FDD,  R.PDSCH.1-16.4 FDD | | | HST-DPS | | | 870 Hz | | | 30000 (Note 1) | | | 1.0526 | | | 32000 | | |
| NA | | | R.PDSCH.1-9.1 FDD,  R.PDSCH.1-9.2 FDD,  R.PDSCH.1-9.3 FDD,  R.PDSCH.1-9.4 FDD,  R.PDSCH.1-9.5 FDD,  R.PDSCH.1-10.1 FDD,  R.PDSCH.1-10.2 FDD | | | TDLA30-10 | | | 10Hz | | | 75000 (Note 1) | | | 1.0526 | | | 79000 | | |
| FR1.15-1 | | | R.PDSCH.1-1.1 TDD, R.PDSCH.1-1.2 TDD | | | TDLA30-10 | | | 10Hz | | | 75000 (Note 1) | | | 2.8571 | | | 215000 | | |
| FR1.15-1 | | | R.PDSCH.1-2.1 TDD,  R.PDSCH.1-2.2 TDD,  R.PDSCH.1-2.3 TDD,  R.PDSCH.1-2.4 TDD,  R.PDSCH.1-2.5 TDD,  R.PDSCH.1-3.1 TDD,  R.PDSCH.1-3.2 TDD,  R.PDSCH.1-3.3 TDD | | | TDLA30-10 | | | 10Hz | | | 75000 (Note 1) | | | 2.8571 | | | 215000 | | |
| FR1.30-1A | | | R.PDSCH.2-1.1 TDD,  R.PDSCH.2-1.5 TDD | | | TDLB100-400 | | | 400 Hz | | | 10000 (Note 1) | | | 1.2903 | | | 13000 | | |
| FR1.30-1 | | | R.PDSCH.2-1.2 TDD, R.PDSCH.2-2.1 TDD, R.PDSCH.2-7.1 TDD,  R.PDSCH.2-26.1 TDD,  R.PDSCH.7-1.1 TDD | | | TDLC300-100 | | | 100 Hz | | | 20000 (Note 1) | | | 1.2903 | | | 26000 | | |
| FR1.30-1 | | | R.PDSCH.2-2.2 TDD, R.PDSCH.2-2.3 TDD, R.PDSCH.2-2.4 TDD, R.PDSCH.2-2.5 TDD, R.PDSCH.2-3.1 TDD, R.PDSCH.2-3.2 TDD, R.PDSCH.2-3.3 TDD, R.PDSCH.2-3.4 TDD,  R.PDSCH.2-3.5 TDD, R.PDSCH.2-4.1 TDD,  R.PDSCH.2-4.3 TDD,  R.PDSCH.7-1.2 TDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 1) | | | 1.2903 | | | 97000 | | |
| FR1.30-1 | | | R.PDSCH.2-1.3 TDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 1) | | | 1.4815 | | | 112000 | | |
| FR1.30-1 | | | R.PDSCH.2-25.1 TDD | | | TDLD30-5 | | | 5 Hz | | | 70000 (Note 1) | | | 1.2903 | | | 91000 | | |
| FR1.30-2 | | | R.PDSCH.2-5.1 TDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 1) | | | 1.2903 | | | 97000 | | |
| FR1.30-2 | | | R.PDSCH.2-17.1 TDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 1) | | | 5 | | | 375000 | | |
| FR1.30-3 | | | R.PDSCH.2-6.1 TDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 1) | | | 1.4815 | | | 112000 | | |
| FR1.30-4 | | | R.PDSCH.2-9.1 TDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 1) | | | 1.2903 | | | 97000 | | |
| FR1.30-5 | | | R.PDSCH.2-11.1 TDD | | | TDLB100-400 | | | 400Hz | | | 10000 (Note 1) | | | 1.2903 | | | 13000 | | |
| FR1.30-6 | | | R.PDSCH.2-12.1 TDD | | | TDLB100-400 | | | 400Hz | | | 10000 (Note 1) | | | 1.2903 | | | 13000 | | |
| FR1.30-1 | | | R.PDSCH.2-10.1 TDD | | | HST-1000 | | | 1000 Hz | | | 15000 (Note 1) | | | 1.4815 | | | 23000 | | |
| FR1.30-1 | | | R.PDSCH.2-10.1 TDD | | | HST-1667 | | | 1667 Hz | | | 15000 (Note 1) | | | 1.4815 | | | 23000 | | |
| FR1.30-1 | | | R.PDSCH.2-10.4 TDD,  R.PDSCH.2-19.1 TDD,  R.PDSCH.2-19.2 TDD,  R.PDSCH.2-19.3 TDD,  R.PDSCH.2-19.4 TDD,  R.PDSCH.2-19.5 TDD,  R.PDSCH.2-20.1 TDD,  R.PDSCH.2-20.2 TDD,  R.PDSCH.2-20.3 TDD,  R.PDSCH.2-20.4 TDD,  R.PDSCH.2-20.5 TDD,  R.PDSCH.2-21.1 TDD | | | HST-SFN | | | 1667 Hz | | | 30000 (Note 1) | | | 1.4815 | | | 45000 | | |
| FR1.30-1 | | | R.PDSCH.2-10.5 TDD,  R.PDSCH.2-22.1 TDD,  R.PDSCH.2-22.2 TDD,  R.PDSCH.2-22.3 TDD,  R.PDSCH.2-22.4 TDD,  R.PDSCH.2-22.5 TDD,  R.PDSCH.2-23.1 TDD,  R.PDSCH.2-23.2 TDD,  R.PDSCH.2-23.3 TDD,  R.PDSCH.2-23.4 TDD,  R.PDSCH.2-23.5 TDD,  R.PDSCH.2-24.1 TDD | | | HST-DPS | | | 1667 Hz | | | 30000 (Note 1) | | | 1.4815 | | | 45000 | | |
| FR1.30-1 | | | R.PDSCH.2-30.1 TDD | | | HST-SFN Scheme A  HST-SFN Scheme B | | | 1667 Hz | | | [30000 (Note 1)] | | | 1.4815 | | | [45000] | | |
| FR1.30-1 | | | R.PDSCH.2-13.1 TDD,  R.PDSCH.2-13.2 TDD,  R.PDSCH.2-13.3 TDD,  R.PDSCH.2-13.4 TDD,  R.PDSCH.2-13.5 TDD,  R.PDSCH.2-14.1 TDD,  R.PDSCH.2-14.2 TDD,  R.PDSCH.2-14.3 TDD,  R.PDSCH.2-14.4 TDD,  R.PDSCH.2-14.5 TDD,  R.PDSCH.2-15.1 TDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 1) | | | 1.2903 | | | 97000 | | |
| FR1.30-7 | | | R.PDSCH.2-18.1 TDD,  R.PDSCH.2-18.2 TDD,  R.PDSCH.2-18.3 TDD,  R.PDSCH.2-18.4 TDD | | | TDLA30-10 | | | 10 Hz | | | 75000 (Note 2) | | | 1.6129 (Note 4) | | | [121000] | | |
| FR2.60-1 | | | R.PDSCH.4-1.1 TDD | | | TDLA30-75 | | | 75 Hz | | | 20000 (Note 2) | | | 1.33 | | | 27000 | | |
| FR2.120-1A | | | R.PDSCH.5-1.1 TDD | | | TDLC60-300 | | | 300 Hz | | | 10000 (Note 2) | | | 1.25 | | | 13000 | | |
| FR2.120-1 | | | R.PDSCH.5-2.1 TDD, R.PDSCH.5-2.2 TDD, R.PDSCH.5-2.3 TDD, R.PDSCH.5-3.1 TDD | | | TDLA30-300 | | | 300 Hz | | | 10000 (Note 2) | | | 1.25 | | | 13000 | | |
| FR2.120-1 | | | R.PDSCH.5-1.2 TDD | | | TDLA30-75 | | | 75 Hz | | | 20000 (Note 2) | | | 1.25 | | | 25000 | | |
| FR2.120-2 | | | R.PDSCH.5-4.1 TDD, R.PDSCH.5-5.1 TDD, R.PDSCH.5-5.2 TDD, R.PDSCH.5-6.1 TDD | | | TDLA30-75 | | | 75 Hz | | | 20000 (Note 2) | | | 1.33 | | | 27000 | | |
| FR2.120-1 | | | R.PDSCH.5-10.1 TDD | | | TDLD30-75 | | | 75 Hz | | | 20000 (Note 2) | | | 1.26 | | | 26000 | | |
| Note 1: MNAS determined by simulations.  Note 2: For cases where MNAS is not determined by simulations, use same MNAS as the similar case simulated (same doppler speed)  Note 3: MNS/MNAS ratio decided by scheduling pattern and is ratio of all slots to DL slots.  Note 4: To account for the LBT failure probability of 0.25, MNS scaled up by 25% | | | | | | | | | | | | | | | | | | | | |

Table G.1.5-1a: Minimum Test time for PDSCH demodulation with 1% BLER

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| TDD UL-DL pattern | Reference Channel | Propagation condition | Demodulation scenario (doppler speed) | Minimum number of active subframes (MNAS) | MNAS to MNS Scaling factor (Note 3) | Minimum Number of Subframes  (MNS) after rounding up to nearest thousand  MNS= |
| NA | R.PDSCH.1-11.1 FDD  R.PDSCH.1-11.2 FDD | TDLA30-10 | 10 Hz | 70000 (Note 1) | 1.1111 | 78000 |
| FR1.30-1 | R.PDSCH.2-16.1 TDD  R.PDSCH.2-16.2 TDD | TDLA30-10 | 10 Hz | 70000 (Note 1) | 1.6667 | 117000 |
| FR2.120-2 | R.PDSCH.5-11.1 TDD | TDLA30-75 | 75 Hz | 70000 (Note 1) | 2.0513 | 144000 |
| Note 1: MNAS determined by simulations.  Note 2: For cases where MNAS is not determined by simulations, use same MNAS as the similar case simulated (same doppler speed).  Note 3: MNS/MNAS ratio decided by scheduling pattern (how much time is required to collect required number of active DL SFs). | | | | | | |

Table G.1.5-2: Minimum Test time for PDCCH demodulation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reference Channel | Demodulation scenario (doppler speed) | Minimum number of active subframes  (MNAS) | MNAS to MNS Scaling factor (Note 3) | Minimum Number of Subframes  (MNS) after rounding up to nearest thousand  MNS= |
| R.PDCCH 1-1.1 FDD, R.PDCCH.1-1.2 FDD, R.PDCCH.1-1.3 FDD, R.PDCCH.1-2.1 FDD, R.PDCCH.1-2.2 FDD, R.PDCCH.1-2.3 FDD, R.PDCCH.1-2.4 FDD, R.PDCCH.1-2.5 FDD, R.PDCCH.1-2.6 FDD | 10, 100, 400 Hz | 100000 (Note 1) | 1.0526 | 106000 |
| R.PDCCH.2-1.1 TDD, R.PDCCH.2-1.2 TDD, R.PDCCH.2-2.1 TDD, R.PDCCH.2-1.3 TDD, R.PDCCH.2-1.5 TDD, R.PDCCH.2-1.6 TDD | 10, 100, 400 Hz | 100000 (Note 1) | 1.2903 | 130000 |
| R.PDCCH.5-1.1 TDD, R.PDCCH.5-1.2 TDD, R.PDCCH.5-1.3 TDD, R.PDCCH.5-2.1 TDD | 75, 300 Hz | 100000 (Note 2) | 1.25 | 130000 |
| R.PDCCH.1-2.4 FDD+ R.PDCCH.1-2.7 FDD | 10Hz | 100000 (Note 1) | 2 (Note 4) | 200000 |
| R.PDCCH.2-1.2 TDD+ R.PDCCH.2-1.4 TDD | 100 Hz | 100000 (Note 1) | 2.666 (Note 4) | 267000 |
| R.PDCCH.5-1.2 TDD, R.PDCCH.5-1.4 TDD | 300 Hz | 100000 (Note 2) | 2.58 (Note 4) | 258000 |
| Note 1: MNAS determined by simulations.  Note 2: For cases where MNS is not determined by simulations, use same MNAS as the similar case simulated (same doppler speed)  Note 3: MNS/MNAS ratio decided by scheduling pattern and is ratio of all slots to DL slots.  Note 4: For power saving, MNS/MNAS ratio decided by scheduling pattern and DRX configuration, and is ratio of all slots in both DRX active time and DRX inactive time to DL slots in DRX active time. | | | | |

# G.2 Theory to derive the numbers for statistical testing (informative)

Editor's note: This clause of the Annex G is for information only and it described the background theory and information for statistical testing.

## G.2.1 Error Ratio (ER)

The Error Ratio (ER) is defined as the ratio of number of errors (ne) to all results, number of samples (ns).

(1-ER is the success ratio).

## G.2.2 Test Design

A statistical test is characterized by:

Test-time, Selectivity and Confidence level.

## G.2.3 Confidence level

The outcome of a statistical test is a decision. This decision may be correct or in-correct. The Confidence Level CL describes the probability that the decision is a correct one. The complement is the wrong decision probability (risk) D = 1-CL.

## G.2.4 Introduction: Supplier Risk versus Customer Risk

There are two targets of decision:

(a) A measurement on the pass-limit shows, that the DUT has the specified quality or is better with probability CL (CL e.g.95 %). This shall lead to a "pass decision".

The pass-limit is on the good side of the specified DUT-quality. A more stringent CL (CL e.g.99 %) shifts the pass-limit farer into the good direction. Given the quality of the DUTs is distributed, a greater CL passes less and better DUTs.

A measurement on the bad side of the pass-limit is simply "not pass" (undecided or artificial fail).

(aa) Complementary:

A measurement on the fail-limit shows, that the DUT is worse than the specified quality with probability CL.

The fail-limit is on the bad side of the specified DUT-quality. A more stringent CL shifts the fail-limit farer into the bad direction. Given the quality of the DUTs is distributed, a greater CL fails less and worse DUTs.

A measurement on the good side of the fail-limit is simply "not fail".

(b) A DUT, known to have the specified quality, shall be measured and decided pass with probability CL. This leads to the test limit.

For CL e.g. 95 %, the test limit is on the bad side of the specified DUT-quality. CL e.g.99 % shifts the pass-limit farer into the bad direction. Given the DUT-quality is distributed, a greater CL passes more and worse DUTs.

(bb) A DUT, known to be an (ε🡪0) beyond the specified quality, shall be measured and decided fail with probability CL.

For CL e.g.95 %, the test limit is on the good side of the specified DUT-quality.

NOTE 1: The different sense for CL in (a), (aa) versus (b), (bb).

NOTE 2: For constant CL in all 4 bullets (a) is equivalent to (bb) and (aa) is equivalent to (b).

## G.2.5 Supplier Risk versus Customer Risk

The table below summarizes the different targets of decision.

Table G.2.5-1: Equivalent statements

|  |  |  |
| --- | --- | --- |
|  | Equivalent statements, using different cause-to-effect-directions,  and assuming CL = constant >1/2 | |
| cause-to-effect-directions | Known measurement result 🡪 estimation of the DUT's quality | Known DUT's quality 🡪 estimation of the measurement's outcome |
| Supplier Risk | A measurement on the pass-limit shows, that the DUT has the specified quality or is better (a) | A DUT, known to have an (ε🡪0) beyond the specified DUT-quality, shall be measured and decided fail (bb) |
| Customer Risk | A measurement on the fail-limit shall shows, that the DUT is worse than the specified quality (aa) | A DUT, known to have the specified quality, shall be measured and decided pass (b) |

The shaded area shown the direct interpretation of Supplier Risk and Customer Risk.

The same statements can be based on other DUT-quality-definitions.

## G.2.6 Introduction: Standard test versus early decision concept

In standard statistical tests, a certain number of results (ns) is predefined in advance to the test. After ns results the number of bad results (ne) is counted and the error ratio (ER) is calculated by ne/ns.

Applying statistical theory, a decision limit can be designed, against which the calculated ER is compared to derive the decision. Such a limit is one decision point and is characterized by:

- D: the wrong decision probability (a predefined parameter)

- ns: the number of results (a fixed predefined parameter)

- ne: the number of bad results (the limit based on just ns)

In the formula for the limit, D and ns can be understood as variable parameter and variable. However the standard test execution requires fixed ns and D. The property of such a test is: It discriminates between two states only, depending on the test design:

- pass (with CL) / undecided (undecided in the sense: finally undecided)

- fail (with CL) / undecided (undecided in the sense: finally undecided)

- pass(with CL) / fail (with CL) (however against two limits).

In contrast to the standard statistical tests, the early decision concept predefines a set of (ne,ns) co-ordinates, representing the limit-curve for decision. After each result a preliminary ER is calculated and compared against the limit-curve. After each result one may make the decision or not (undecided for later decision). The parameters and variables in the limit-curve for the early decision concept have a similar but not equal meaning:

- D: the wrong decision probability (a predefined parameter)

- ns: the number of results (a variable parameter)

- ne: the number of bad results (the limit. It varies together with ns)

To avoid a "final undecided" in the standard test, a second limit shall be introduced and the single decision co-ordinate (ne,ns) needs a high ne, leading to a fixed (high) test time. In the early decision concept, having the same selectivity and the same confidence level an "undecided" need not to be avoided, as it can be decided later. A perfect DUT will hit the decision coordinate (ne,ns) with ne=0. This test time is short.

## G.2.7 Standard test versus early decision concept

For Supplier Risk:

The wrong decision probability D in the standard test is the probability, to decide a DUT in-correct in the single decision point. In the early decision concept there is a probability of in-correct decisions d at each point of the limit-curve. The sum of all those wrong decision probabilities accumulate to D. Hence d<D.

For Customer Risk:

The correct decision probability CL in the standard test is the probability, to decide a DUT correct in the single decision point. In the early decision concept there is a probability of correct decisions cl at each point of the limit-curve. The sum of all those correct decision probabilities accumulate to CL. Hence cl<CL or d>D.

## G.2.8 Selectivity

There is no statistical test which can discriminate between a limit DUT and a DUT which is an (ε🡪0) apart from the limit in finite time and high confidence level CL. Either the test discriminates against one limit with the results pass (with CL)/undecided or fail (with CL)/undecided, or the test ends in a result pass (with CL)/fail (with CL) but this requires a second limit.

For CL>1/2, a (measurement-result = specified-DUT-quality), generates undecided in test "supplier risk against pass limit" (a, from above) and also in the test "customer risk against the fail limit " (aa)

For CL>1/2, a DUT, known to be on the limit, will be decided pass for the test "customer risk against pass limit" (b) and also "supplier risk against fail limit" (bb).

This overlap or undecided area is not a fault or a contradiction, however it can be avoided by introducing a Bad or a Good DUT quality according to:

- Bad DUT quality: specified DUT-quality \* M (M>1)

- Good DUT quality: specified DUT-quality \* m (m<1)

Using e.g. M>1 and CL=95  % the test for different DUT qualities yield different pass probabilities:



Figure G.2.8-1: Pass probability versus DUT quality

## G.2.9 Design of the test

The receiver characteristic test are defined by the following design principles:

1. The early decision concept is applied.

2. A second limit is introduced: Bad DUT factor M>1

3. To decide the test pass:

Supplier risk is applied based on the Bad DUT quality

To decide the test fail

Customer Risk is applied based on the specified DUT quality

The receiver characteristic test are defined by the following parameters:

1. Limit ER = 0.05

2. Bad DUT factor M=1.5 (selectivity)

3. Confidence level CL = 95 % (for specified DUT and Bad DUT-quality)

This has the following consequences:

1. A measurement on the fail limit is connected with 2 equivalent statements:

|  |  |
| --- | --- |
| A measurement on the fail-limit shows, that the DUT is worse than the specified DUT-quality | A DUT, known have the specified quality, shall be measured and decided pass |

2. A measurement on the pass limit is connected with the complementary statements:

|  |  |
| --- | --- |
| A measurement on the pass limit shows, that the DUT is better than the Bad DUT-quality. | A DUT, known to have the Bad DUT quality, shall be measured and decided fail |

The left column is used to decide the measurement.

The right column is used to verify the design of the test by simulation.

The simulation is based on the two fulcrums A and B only in Figure G.2.8-1

3. Test time

The minimum and maximum test time is fixed.

The average test time is a function of the DUT's quality.

The individual test time is not predictable.

4. The number of decision co-ordinates (ne,ns) in the early decision concept is responsible for the selectivity of the test and the maximum test time. Having fixed the number of decision co-ordinates there is still freedom to select the individual decision co-ordinates in many combinations, all leading to the same confidence level.

## G.2.10 Simulation to derive the pass fail limits

There is freedom to design the decision co-ordinates (ne,ns).

The binomial distribution and its inverse is used to design the pass and fail limits. Note that this method is not unique and that other methods exist.



Where

- fail(..) is the error ratio for the fail limit

- pass(..) is the error ratio for the pass limit

- ER is the specified error ratio 0.05

- ne is the number of bad results. This is the variable in both equations

- M is the Bad DUT factor M=1.5

- df is the wrong decision probability of a single (ne,ns) co-ordinate for the fail limit.   
 It is found by simulation to be df = 0.004

- clp is the confidence level of a single (ne,ns) co-ordinate for the pass limit.  
It is found by simulation to be clp = 0.9975

- qnbinom(..): The inverse cumulative function of the negative binomial distribution

The simulation works as follows:

- A large population of limit DUTs with true ER = 0.05 is decided against the pass and fail limits.

- clp and df are tuned such that CL (95 %) of the population passes and D (5 %) of the population fails.

- A population of Bad DUTs with true ER = M\*0.05 is decided against the same pass and fail limits.

- clp and df are tuned such that CL (95 %) of the population fails and D (5 %) of the population passes.

- This procedure and the relationship to the measurement is justified in clause G.2.9. The number of DUTs decrease during the simulation, as the decided DUTs leave the population. That number decreases with an approximately exponential characteristics. After 169 bad results all DUTs of the population are decided.

NOTE: The exponential decrease of the population is an optimal design goal for the decision co-ordinates (ne,ns), which can be achieved with other formulas or methods as well.

# G.3 Measuring throughput ratio

## G.3.1 General

Annex G.3 is applicable for clauses 6.2, 6,3 and 6.4. Common to those clauses is, that a throughput ratio γ of the form  is measured. These clauses are tested exclusively with “slow” multipath fading profiles. Hence the test time is governed by test time due to fading, and number of samples due to statistical significance is not applicable.



The test requirement in clause 6.3 is a ratio of 2 throughput tests γ. In either numerator or denominator (depending on test case) a target throughput is desired, which is established by an approach resulting in the throughput and the reference SNR that is defined in G.3.2. This SNR is then reused when measuring the throughput of the other factor of the formula. The formulas for calculation of γ are defined directly under sections 6.3.

The test requirements in clauses 6.2 and 6.4 are a ratio of 2 throughput tests γ, where numerator and denominator are ordinary throughput tests. The formulas for calculation of γ are defined in sections 6.2 and 6.4 respectively

## G.3.2 Establishing SNR

Adjust SNR such that the measured throughput is within 2% of target value (TBD% depending on test case). The approach, leading to target throughput and reference SNR is not specified.

The resulting SNR is the reference SNR to use when measuring throughput in the other factor (numerator or denominator) of γ.

To achieve statistical significance the final throughput measurement must be done with MNS samples, given table G.3.4-1

## G.3.3 Measuring T-put

To achieve statistical significance the final throughput measurement must be done with MNS samples, given in table G.3.4 -1. Number of samples due to statistical significance is not applicable.

For measuring tue,follow1,follow2 and tue,rnd1,rnd2, the SS collects ACK, NACK and statDTX from the UE and records the time, elapsed from the beginning of the test. The payload size, received by the UE and acknowledged towards the SS, is constant. Throughput can be calculated in the SS by multiplying the payload size with the number of ACKs and dividing the accumulated payload in kilobits by the time in seconds, elapsed from the beginning of the test, being associated to the following ratio: ACK/ (ACK+NACK + DTX).

## G.3.4 Number of samples for throughput ratios

Table G.3.4-1: Test time for testing throughput ratios

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Demodulation scenario (doppler speed) | | Minimum number of active subframes  (MNAS) | | Scheduling pattern | | MNAS to MNS Scaling factor (Note 2) | | Minimum Number of Subframes  (MNS) after rounding up to nearest thousand  MNS= | |
| 5Hz | | 100000 | | FDD | | 1.0526 | | 106000 | |
| 5Hz | | 100000 | | TDD FR1.30-1 | | 1.2903 | | 130000 | |
| 35Hz | | 100000 | | TDD FR2.120-1 | | 1.2598 | | 126000 | |
| 35Hz | | 100000 | | TDD FR2.120-2 | | 1.3445 | | 135000 | |
| Note 1: MNAS determined by theoretical estimations inherited from LTE based on R5-106393. All slots in active subframe is assumed to be DL slots.  Note 2: MNS/MNAS ratio decided by scheduling pattern and is ratio of all slots to DL slots  Note 3: MNS apply for both denominator and numerator measurement | | | | | | | | | |

# G.4 Statistical testing of Performance Requirements with BLER limit

## G.4.1 General

The test of receiver performance characteristics is twofold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.

2. The ability of the receiver to demodulate /decode this signal is verified by measuring the throughput.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for several receiver performance test cases is specified in regards of BLER: 0.001%.

## G.4.2 Design of the test

The test is defined by the following design principles (see clause G.2, Theory):

1. The early decision concept is applied.

2. A second limit is introduced: Bad DUT factor M>1.

3. To decide the test pass:

Supplier risk is applied based on the Bad DUT quality

To decide the test fail:

Customer Risk is applied based on the specified DUT quality

## G.4.3 Numerical definition of the pass fail limits for 0.001% BLER

The numerical pass/fail limit is derived by the following parameters:

1a) Limit Error Ratio = 0.001%

2a) Bad DUT factor M=1.5 (selectivity)

justification see: TS 34.121 Clause F.6.3.3

3) Confidence level CL = 99.999%

Table G.4.3-1: Pass fail limits

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ne | nsp | nsf | ne | nsp | nsf | ne | nsp | nsf |
| 0 | 1074532 | 1067 | 215 | 20006574 | 14871394 | 430 | 36441701 | 33298651 |
| 1 | 1074532 | 1067 | 216 | 20085020 | 14954177 | 431 | 36516711 | 33386452 |
| 2 | 1274645 | 1067 | 217 | 20163439 | 15036999 | 432 | 36591711 | 33474268 |
| 3 | 1444583 | 1067 | 218 | 20241831 | 15119861 | 433 | 36666702 | 33562097 |
| 4 | 1599072 | 4727 | 219 | 20320196 | 15202761 | 434 | 36741683 | 33649940 |
| 5 | 1743641 | 12160 | 220 | 20398535 | 15285701 | 435 | 36816654 | 33737797 |
| 6 | 1881111 | 23683 | 221 | 20476847 | 15368679 | 436 | 36891616 | 33825668 |
| 7 | 2013164 | 39190 | 222 | 20555133 | 15451695 | 437 | 36966568 | 33913553 |
| 8 | 2140902 | 58403 | 223 | 20633393 | 15534749 | 438 | 37041511 | 34001452 |
| 9 | 2265092 | 81000 | 224 | 20711628 | 15617841 | 439 | 37116445 | 34089364 |
| 10 | 2386297 | 106667 | 225 | 20789836 | 15700971 | 440 | 37191369 | 34177291 |
| 11 | 2504945 | 135116 | 226 | 20868019 | 15784137 | 441 | 37266283 | 34265231 |
| 12 | 2621369 | 166089 | 227 | 20946177 | 15867341 | 442 | 37341189 | 34353184 |
| 13 | 2735834 | 199360 | 228 | 21024309 | 15950581 | 443 | 37416085 | 34441151 |
| 14 | 2848557 | 234730 | 229 | 21102417 | 16033858 | 444 | 37490972 | 34529132 |
| 15 | 2959718 | 272025 | 230 | 21180499 | 16117172 | 445 | 37565849 | 34617126 |
| 16 | 3069467 | 311091 | 231 | 21258557 | 16200521 | 446 | 37640718 | 34705134 |
| 17 | 3177931 | 351792 | 232 | 21336590 | 16283906 | 447 | 37715577 | 34793155 |
| 18 | 3285220 | 394009 | 233 | 21414599 | 16367326 | 448 | 37790427 | 34881189 |
| 19 | 3391428 | 437636 | 234 | 21492584 | 16450782 | 449 | 37865268 | 34969237 |
| 20 | 3496637 | 482577 | 235 | 21570545 | 16534273 | 450 | 37940100 | 35057298 |
| 21 | 3600921 | 528746 | 236 | 21648482 | 16617799 | 451 | 38014923 | 35145372 |
| 22 | 3704343 | 576068 | 237 | 21726395 | 16701360 | 452 | 38089737 | 35233459 |
| 23 | 3806960 | 624473 | 238 | 21804284 | 16784955 | 453 | 38164542 | 35321560 |
| 24 | 3908823 | 673898 | 239 | 21882150 | 16868585 | 454 | 38239338 | 35409673 |
| 25 | 4009977 | 724286 | 240 | 21959993 | 16952248 | 455 | 38314125 | 35497800 |
| 26 | 4110465 | 775585 | 241 | 22037812 | 17035945 | 456 | 38388903 | 35585939 |
| 27 | 4210324 | 827748 | 242 | 22115608 | 17119676 | 457 | 38463672 | 35674092 |
| 28 | 4309587 | 880730 | 243 | 22193382 | 17203440 | 458 | 38538432 | 35762258 |
| 29 | 4408285 | 934492 | 244 | 22271133 | 17287238 | 459 | 38613184 | 35850436 |
| 30 | 4506448 | 988997 | 245 | 22348861 | 17371068 | 460 | 38687927 | 35938627 |
| 31 | 4604101 | 1044211 | 246 | 22426567 | 17454931 | 461 | 38762661 | 36026831 |
| 32 | 4701268 | 1100101 | 247 | 22504250 | 17538827 | 462 | 38837386 | 36115048 |
| 33 | 4797972 | 1156638 | 248 | 22581911 | 17622755 | 463 | 38912102 | 36203278 |
| 34 | 4894232 | 1213795 | 249 | 22659550 | 17706716 | 464 | 38986810 | 36291520 |
| 35 | 4990069 | 1271547 | 250 | 22737168 | 17790708 | 465 | 39061510 | 36379774 |
| 36 | 5085500 | 1329869 | 251 | 22814763 | 17874733 | 466 | 39136200 | 36468042 |
| 37 | 5180542 | 1388740 | 252 | 22892337 | 17958789 | 467 | 39210882 | 36556322 |
| 38 | 5275209 | 1448137 | 253 | 22969889 | 18042876 | 468 | 39285556 | 36644614 |
| 39 | 5369517 | 1508043 | 254 | 23047420 | 18126994 | 469 | 39360221 | 36732919 |
| 40 | 5463478 | 1568438 | 255 | 23124929 | 18211144 | 470 | 39434877 | 36821237 |
| 41 | 5557107 | 1629304 | 256 | 23202418 | 18295325 | 471 | 39509525 | 36909566 |
| 42 | 5650414 | 1690627 | 257 | 23279885 | 18379536 | 472 | 39584165 | 36997908 |
| 43 | 5743410 | 1752389 | 258 | 23357331 | 18463778 | 473 | 39658796 | 37086263 |
| 44 | 5836108 | 1814577 | 259 | 23434757 | 18548050 | 474 | 39733419 | 37174629 |
| 45 | 5928516 | 1877177 | 260 | 23512162 | 18632353 | 475 | 39808033 | 37263008 |
| 46 | 6020643 | 1940175 | 261 | 23589546 | 18716685 | 476 | 39882639 | 37351399 |
| 47 | 6112500 | 2003560 | 262 | 23666910 | 18801047 | 477 | 39957237 | 37439803 |
| 48 | 6204094 | 2067319 | 263 | 23744254 | 18885439 | 478 | 40031826 | 37528218 |
| 49 | 6295434 | 2131442 | 264 | 23821577 | 18969861 | 479 | 40106407 | 37616645 |
| 50 | 6386526 | 2195916 | 265 | 23898880 | 19054311 | 480 | 40180980 | 37705085 |
| 51 | 6477380 | 2260734 | 266 | 23976164 | 19138791 | 481 | 40255545 | 37793536 |
| 52 | 6568000 | 2325884 | 267 | 24053427 | 19223300 | 482 | 40330102 | 37882000 |
| 53 | 6658395 | 2391358 | 268 | 24130671 | 19307838 | 483 | 40404650 | 37970475 |
| 54 | 6748569 | 2457146 | 269 | 24207895 | 19392404 | 484 | 40479190 | 38058963 |
| 55 | 6838530 | 2523241 | 270 | 24285099 | 19476999 | 485 | 40553722 | 38147462 |
| 56 | 6928283 | 2589634 | 271 | 24362284 | 19561623 | 486 | 40628246 | 38235973 |
| 57 | 7017834 | 2656318 | 272 | 24439450 | 19646274 | 487 | 40702762 | 38324496 |
| 58 | 7107187 | 2723285 | 273 | 24516597 | 19730954 | 488 | 40777270 | 38413030 |
| 59 | 7196348 | 2790528 | 274 | 24593724 | 19815662 | 489 | 40851770 | 38501576 |
| 60 | 7285321 | 2858041 | 275 | 24670832 | 19900397 | 490 | 40926262 | 38590134 |
| 61 | 7374112 | 2925816 | 276 | 24747922 | 19985160 | 491 | 41000746 | 38678704 |
| 62 | 7462724 | 2993848 | 277 | 24824993 | 20069950 | 492 | 41075222 | 38767285 |
| 63 | 7551162 | 3062130 | 278 | 24902045 | 20154768 | 493 | 41149690 | 38855878 |
| 64 | 7639430 | 3130657 | 279 | 24979078 | 20239613 | 494 | 41224150 | 38944482 |
| 65 | 7727532 | 3199424 | 280 | 25056093 | 20324485 | 495 | 41298602 | 39033098 |
| 66 | 7815471 | 3268424 | 281 | 25133089 | 20409383 | 496 | 41373047 | 39121725 |
| 67 | 7903252 | 3337653 | 282 | 25210068 | 20494309 | 497 | 41447483 | 39210364 |
| 68 | 7990878 | 3407105 | 283 | 25287028 | 20579261 | 498 | 41521912 | 39299014 |
| 69 | 8078352 | 3476777 | 284 | 25363970 | 20664239 | 499 | 41596333 | 39387675 |
| 70 | 8165677 | 3546663 | 285 | 25440893 | 20749244 | 500 | 41670746 | 39476348 |
| 71 | 8252857 | 3616759 | 286 | 25517799 | 20834275 | 501 | 41745152 | 39565032 |
| 72 | 8339894 | 3687060 | 287 | 25594687 | 20919332 | 502 | 41819550 | 39653727 |
| 73 | 8426792 | 3757563 | 288 | 25671558 | 21004415 | 503 | 41893940 | 39742434 |
| 74 | 8513553 | 3828263 | 289 | 25748411 | 21089524 | 504 | 41968323 | 39831151 |
| 75 | 8600181 | 3899156 | 290 | 25825246 | 21174658 | 505 | 42042698 | 39919880 |
| 76 | 8686677 | 3970239 | 291 | 25902063 | 21259818 | 506 | 42117065 | 40008620 |
| 77 | 8773044 | 4041508 | 292 | 25978864 | 21345003 | 507 | 42191424 | 40097371 |
| 78 | 8859286 | 4112960 | 293 | 26055647 | 21430213 | 508 | 42265777 | 40186133 |
| 79 | 8945403 | 4184590 | 294 | 26132413 | 21515449 | 509 | 42340121 | 40274907 |
| 80 | 9031399 | 4256396 | 295 | 26209162 | 21600709 | 510 | 42414458 | 40363691 |
| 81 | 9117276 | 4328375 | 296 | 26285893 | 21685995 | 511 | 42488788 | 40452486 |
| 82 | 9203035 | 4400523 | 297 | 26362608 | 21771305 | 512 | 42563110 | 40541292 |
| 83 | 9288680 | 4472838 | 298 | 26439306 | 21856639 | 513 | 42637425 | 40630109 |
| 84 | 9374212 | 4545316 | 299 | 26515987 | 21941999 | 514 | 42711732 | 40718937 |
| 85 | 9459633 | 4617954 | 300 | 26592652 | 22027382 | 515 | 42786032 | 40807776 |
| 86 | 9544944 | 4690751 | 301 | 26669300 | 22112790 | 516 | 42860324 | 40896625 |
| 87 | 9630149 | 4763702 | 302 | 26745931 | 22198222 | 517 | 42934609 | 40985485 |
| 88 | 9715249 | 4836806 | 303 | 26822546 | 22283678 | 518 | 43008887 | 41074356 |
| 89 | 9800245 | 4910060 | 304 | 26899145 | 22369157 | 519 | 43083157 | 41163238 |
| 90 | 9885139 | 4983461 | 305 | 26975727 | 22454661 | 520 | 43157420 | 41252131 |
| 91 | 9969933 | 5057007 | 306 | 27052293 | 22540188 | 521 | 43231676 | 41341034 |
| 92 | 10054629 | 5130696 | 307 | 27128843 | 22625739 | 522 | 43305924 | 41429947 |
| 93 | 10139228 | 5204526 | 308 | 27205377 | 22711313 | 523 | 43380165 | 41518872 |
| 94 | 10223731 | 5278493 | 309 | 27281895 | 22796910 | 524 | 43454399 | 41607806 |
| 95 | 10308141 | 5352597 | 310 | 27358398 | 22882531 | 525 | 43528626 | 41696752 |
| 96 | 10392459 | 5426835 | 311 | 27434884 | 22968175 | 526 | 43602846 | 41785708 |
| 97 | 10476685 | 5501204 | 312 | 27511355 | 23053842 | 527 | 43677058 | 41874674 |
| 98 | 10560822 | 5575703 | 313 | 27587810 | 23139531 | 528 | 43751263 | 41963651 |
| 99 | 10644871 | 5650331 | 314 | 27664249 | 23225243 | 529 | 43825462 | 42052638 |
| 100 | 10728833 | 5725084 | 315 | 27740673 | 23310978 | 530 | 43899653 | 42141635 |
| 101 | 10812709 | 5799961 | 316 | 27817081 | 23396736 | 531 | 43973837 | 42230643 |
| 102 | 10896501 | 5874961 | 317 | 27893475 | 23482516 | 532 | 44048014 | 42319662 |
| 103 | 10980210 | 5950082 | 318 | 27969852 | 23568318 | 533 | 44122183 | 42408690 |
| 104 | 11063837 | 6025321 | 319 | 28046215 | 23654143 | 534 | 44196346 | 42497729 |
| 105 | 11147384 | 6100677 | 320 | 28122563 | 23739989 | 535 | 44270502 | 42586778 |
| 106 | 11230851 | 6176149 | 321 | 28198895 | 23825858 | 536 | 44344651 | 42675837 |
| 107 | 11314239 | 6251735 | 322 | 28275212 | 23911748 | 537 | 44418793 | 42764907 |
| 108 | 11397550 | 6327434 | 323 | 28351515 | 23997661 | 538 | 44492928 | 42853986 |
| 109 | 11480785 | 6403243 | 324 | 28427803 | 24083595 | 539 | 44567056 | 42943076 |
| 110 | 11563945 | 6479161 | 325 | 28504075 | 24169550 | 540 | 44641177 | 43032176 |
| 111 | 11647030 | 6555187 | 326 | 28580333 | 24255527 | 541 | 44715291 | 43121286 |
| 112 | 11730042 | 6631320 | 327 | 28656577 | 24341526 | 542 | 44789399 | 43210406 |
| 113 | 11812982 | 6707558 | 328 | 28732806 | 24427546 | 543 | 44863499 | 43299535 |
| 114 | 11895850 | 6783899 | 329 | 28809020 | 24513587 | 544 | 44937593 | 43388675 |
| 115 | 11978648 | 6860343 | 330 | 28885220 | 24599649 | 545 | 45011680 | 43477825 |
| 116 | 12061377 | 6936887 | 331 | 28961405 | 24685732 | 546 | 45085760 | 43566985 |
| 117 | 12144037 | 7013532 | 332 | 29037577 | 24771836 | 547 | 45159833 | 43656155 |
| 118 | 12226629 | 7090274 | 333 | 29113734 | 24857961 | 548 | 45233900 | 43745334 |
| 119 | 12309155 | 7167114 | 334 | 29189876 | 24944107 | 549 | 45307960 | 43834523 |
| 120 | 12391614 | 7244050 | 335 | 29266005 | 25030273 | 550 | 45382013 | 43923723 |
| 121 | 12474008 | 7321081 | 336 | 29342119 | 25116460 | 551 | 45456059 | 44012932 |
| 122 | 12556338 | 7398206 | 337 | 29418220 | 25202668 | 552 | 45530099 | 44102150 |
| 123 | 12638604 | 7475422 | 338 | 29494306 | 25288896 | 553 | 45604132 | 44191379 |
| 124 | 12720808 | 7552731 | 339 | 29570379 | 25375144 | 554 | 45678159 | 44280617 |
| 125 | 12802949 | 7630129 | 340 | 29646438 | 25461412 | 555 | 45752178 | 44369865 |
| 126 | 12885029 | 7707617 | 341 | 29722483 | 25547700 | 556 | 45826192 | 44459123 |
| 127 | 12967048 | 7785194 | 342 | 29798514 | 25634009 | 557 | 45900198 | 44548390 |
| 128 | 13049007 | 7862857 | 343 | 29874532 | 25720337 | 558 | 45974198 | 44637667 |
| 129 | 13130907 | 7940606 | 344 | 29950536 | 25806685 | 559 | 46048192 | 44726953 |
| 130 | 13212749 | 8018441 | 345 | 30026527 | 25893053 | 560 | 46122179 | 44816249 |
| 131 | 13294533 | 8096360 | 346 | 30102504 | 25979441 | 561 | 46196159 | 44905555 |
| 132 | 13376259 | 8174362 | 347 | 30178468 | 26065848 | 562 | 46270133 | 44994870 |
| 133 | 13457929 | 8252446 | 348 | 30254418 | 26152274 | 563 | 46344100 | 45084194 |
| 134 | 13539543 | 8330612 | 349 | 30330355 | 26238721 | 564 | 46418061 | 45173528 |
| 135 | 13621102 | 8408859 | 350 | 30406279 | 26325186 | 565 | 46492016 | 45262871 |
| 136 | 13702605 | 8487185 | 351 | 30482190 | 26411671 | 566 | 46565964 | 45352224 |
| 137 | 13784055 | 8565589 | 352 | 30558087 | 26498174 | 567 | 46639906 | 45441586 |
| 138 | 13865452 | 8644072 | 353 | 30633972 | 26584697 | 568 | 46713841 | 45530958 |
| 139 | 13946795 | 8722632 | 354 | 30709843 | 26671239 | 569 | 46787770 | 45620339 |
| 140 | 14028086 | 8801268 | 355 | 30785702 | 26757800 | 570 | 46861692 | 45709729 |
| 141 | 14109325 | 8879979 | 356 | 30861547 | 26844380 | 571 | 46935608 | 45799128 |
| 142 | 14190513 | 8958765 | 357 | 30937380 | 26930979 | 572 | 47009518 | 45888537 |
| 143 | 14271650 | 9037625 | 358 | 31013200 | 27017596 | 573 | 47083422 | 45977955 |
| 144 | 14352737 | 9116558 | 359 | 31089007 | 27104232 | 574 | 47157319 | 46067382 |
| 145 | 14433775 | 9195563 | 360 | 31164802 | 27190886 | 575 | 47231210 | 46156818 |
| 146 | 14514763 | 9274640 | 361 | 31240584 | 27277559 | 576 | 47305094 | 46246264 |
| 147 | 14595702 | 9353788 | 362 | 31316353 | 27364250 | 577 | 47378973 | 46335719 |
| 148 | 14676593 | 9433006 | 363 | 31392110 | 27450959 | 578 | 47452845 | 46425182 |
| 149 | 14757437 | 9512294 | 364 | 31467854 | 27537687 | 579 | 47526711 | 46514655 |
| 150 | 14838233 | 9591650 | 365 | 31543586 | 27624433 | 580 | 47600570 | 46604137 |
| 151 | 14918983 | 9671074 | 366 | 31619306 | 27711197 | 581 | 47674424 | 46693628 |
| 152 | 14999686 | 9750566 | 367 | 31695013 | 27797979 | 582 | 47748271 | 46783128 |
| 153 | 15080344 | 9830124 | 368 | 31770708 | 27884779 | 583 | 47822113 | 46872637 |
| 154 | 15160956 | 9909749 | 369 | 31846390 | 27971597 | 584 | 47895948 | 46962155 |
| 155 | 15241523 | 9989439 | 370 | 31922061 | 28058432 | 585 | 47969777 | 47051682 |
| 156 | 15322045 | 10069194 | 371 | 31997719 | 28145286 | 586 | 48043599 | 47141218 |
| 157 | 15402524 | 10149014 | 372 | 32073365 | 28232157 | 587 | 48117416 | 47230762 |
| 158 | 15482959 | 10228896 | 373 | 32149000 | 28319045 | 588 | 48191227 | 47320316 |
| 159 | 15563350 | 10308842 | 374 | 32224622 | 28405951 | 589 | 48265031 | 47409879 |
| 160 | 15643699 | 10388851 | 375 | 32300232 | 28492875 | 590 | 48338830 | 47499450 |
| 161 | 15724005 | 10468921 | 376 | 32375831 | 28579815 | 591 | 48412622 | 47589030 |
| 162 | 15804270 | 10549052 | 377 | 32451417 | 28666774 | 592 | 48486409 | 47678619 |
| 163 | 15884492 | 10629245 | 378 | 32526992 | 28753749 | 593 | 48560190 | 47768217 |
| 164 | 15964673 | 10709497 | 379 | 32602555 | 28840741 | 594 | 48633964 | 47857823 |
| 165 | 16044814 | 10789809 | 380 | 32678107 | 28927751 | 595 | 48707733 | 47947438 |
| 166 | 16124913 | 10870180 | 381 | 32753646 | 29014778 | 596 | 48781495 | 48037062 |
| 167 | 16204973 | 10950610 | 382 | 32829175 | 29101821 | 597 | 48855252 | 48126695 |
| 168 | 16284993 | 11031098 | 383 | 32904691 | 29188882 | 598 | 48929003 | 48216336 |
| 169 | 16364973 | 11111643 | 384 | 32980196 | 29275959 | 599 | 49002747 | 48305986 |
| 170 | 16444914 | 11192245 | 385 | 33055690 | 29363053 | 600 | 49076486 | 48395644 |
| 171 | 16524817 | 11272904 | 386 | 33131172 | 29450164 | 601 | 49150219 | 48485312 |
| 172 | 16604680 | 11353619 | 387 | 33206643 | 29537291 | 602 | 49223946 | 48574987 |
| 173 | 16684506 | 11434390 | 388 | 33282102 | 29624435 | 603 | 49297668 | 48664671 |
| 174 | 16764294 | 11515215 | 389 | 33357550 | 29711596 | 604 | 49371383 | 48754364 |
| 175 | 16844045 | 11596095 | 390 | 33432987 | 29798773 | 605 | 49445093 | 48844065 |
| 176 | 16923758 | 11677030 | 391 | 33508413 | 29885966 | 606 | 49518797 | 48933775 |
| 177 | 17003435 | 11758018 | 392 | 33583827 | 29973176 | 607 | 49592495 | 49023493 |
| 178 | 17083075 | 11839059 | 393 | 33659230 | 30060402 | 608 | 49666187 | 49113220 |
| 179 | 17162679 | 11920153 | 394 | 33734623 | 30147644 | 609 | 49739874 | 49202955 |
| 180 | 17242247 | 12001299 | 395 | 33810004 | 30234902 | 610 | 49813554 | 49292699 |
| 181 | 17321779 | 12082497 | 396 | 33885374 | 30322176 | 611 | 49887229 | 49382451 |
| 182 | 17401276 | 12163747 | 397 | 33960734 | 30409467 | 612 | 49960899 | 49472211 |
| 183 | 17480738 | 12245048 | 398 | 34036082 | 30496773 | 613 | 50034562 | 49561980 |
| 184 | 17560165 | 12326400 | 399 | 34111419 | 30584095 | 614 | 50108220 | 49651757 |
| 185 | 17639558 | 12407801 | 400 | 34186746 | 30671433 | 615 | 50181872 | 49741542 |
| 186 | 17718917 | 12489253 | 401 | 34262062 | 30758787 | 616 | 50255519 | 49831335 |
| 187 | 17798241 | 12570754 | 402 | 34337367 | 30846156 | 617 | 50329160 | 49921137 |
| 188 | 17877532 | 12652304 | 403 | 34412662 | 30933541 | 618 | 50402795 | 50010947 |
| 189 | 17956790 | 12733903 | 404 | 34487945 | 31020942 | 619 | 50476425 | 50100765 |
| 190 | 18036015 | 12815550 | 405 | 34563218 | 31108358 | 620 | 50550049 | 50190592 |
| 191 | 18115206 | 12897245 | 406 | 34638481 | 31195790 | 621 | 50623667 | 50280427 |
| 192 | 18194366 | 12978988 | 407 | 34713733 | 31283237 | 622 | 50697280 | 50370270 |
| 193 | 18273492 | 13060777 | 408 | 34788974 | 31370699 | 623 | 50770887 | 50460120 |
| 194 | 18352587 | 13142614 | 409 | 34864205 | 31458177 | 624 | 50844489 | 50549980 |
| 195 | 18431650 | 13224497 | 410 | 34939426 | 31545670 | 625 | 50918085 | 50639847 |
| 196 | 18510681 | 13306426 | 411 | 35014636 | 31633178 | 626 | 50991676 | 50729722 |
| 197 | 18589681 | 13388401 | 412 | 35089836 | 31720702 | 627 | 51065261 | 50819605 |
| 198 | 18668650 | 13470421 | 413 | 35165025 | 31808240 | 628 | 51138840 | 50909497 |
| 199 | 18747588 | 13552486 | 414 | 35240204 | 31895794 | 629 | 51212414 | 50999396 |
| 200 | 18826495 | 13634596 | 415 | 35315373 | 31983362 | 630 | 51285983 | 51089304 |
| 201 | 18905372 | 13716750 | 416 | 35390532 | 32070946 | 631 | 51359546 | 51179219 |
| 202 | 18984219 | 13798949 | 417 | 35465680 | 32158544 | 632 | 51433104 | 51269143 |
| 203 | 19063035 | 13881191 | 418 | 35540819 | 32246157 | 633 | 51506656 | 51359074 |
| 204 | 19141822 | 13963476 | 419 | 35615947 | 32333785 | 634 | 51580203 | 51449013 |
| 205 | 19220579 | 14045805 | 420 | 35691065 | 32421428 | 635 | 51653744 | 51538961 |
| 206 | 19299307 | 14128176 | 421 | 35766173 | 32509085 | 636 | 51727280 | 51628916 |
| 207 | 19378006 | 14210590 | 422 | 35841272 | 32596757 | 637 | 51800811 | 51718879 |
| 208 | 19456676 | 14293046 | 423 | 35916360 | 32684443 | 638 | 51874336 | 51808850 |
| 209 | 19535318 | 14375544 | 424 | 35991438 | 32772144 | 639 | 51947856 | 51898828 |
| 210 | 19613930 | 14458083 | 425 | 36066507 | 32859859 | 640 | 52021370 | 51988815 |
| 211 | 19692515 | 14540664 | 426 | 36141565 | 32947589 | 641 | 52094880 | 52078809 |
| 212 | 19771071 | 14623286 | 427 | 36216614 | 33035333 | 642 | 52168384 | 52168811 |
| 213 | 19849600 | 14705948 | 428 | 36291653 | 33123092 |  |  |  |
| 214 | 19928101 | 14788651 | 429 | 36366682 | 33210864 |  |  |  |

NOTE 1: The first column is the number of errors (ne = number of NACK).

NOTE 2: The second column is the number of samples for the pass limit (nsp, ns=Number of Samples= number of NACK + ACK).

NOTE 3: The third column is the number of samples for the fail limit (nsf).

NOTE 4: An ideal DUT passes after 1074532 samples. The maximum test time is 52171625 samples. A DUT passes, if the maximum number of samples is reached and it did not fail before.

## G.4.3a Pass fail decision rules

The pass fail decision rules apply for a single test.

Having observed 1 error, pass the test at 1074532+ samples, fail the test at 1067- samples, otherwise continue

Having observed 2 errors, pass the test at 1274645+ samples, fail the test at 1067- samples, otherwise continue

Having observed 3 errors, pass the test at 1444583+ samples, fail the test at 1067- samples, otherwise continue

Having observed 4 errors, pass the test at 1599072+ samples, fail the test at 4727- samples, otherwise continue

…

Having observed 641 errors, pass the test at 52094880+ samples, fail the test at 52078809- samples, otherwise continue

Having observed 642 errors, pass the test at 52168384+ samples, fail the test at 52168811- samples.

Where x+ means: x or more, x- means x or less

NOTE 1: an ideal DUT passes after 1074532 samples. The maximum test time is 52168384 samples.

## G.4.4 Simulation to derive the pass-fail limits for 0.001% BLER

The binomial distribution and its inverse are used to design the pass and fail limits. Note that this method is not unique and that other methods exist.



Where

- fail(..) is the error ratio for the fail limit.

- pass(..) is the error ratio for the pass limit.

- ER is the specified error ratio 1e-5.

- ne is the number of bad results. This is the variable in both equations.

- M is the Bad DUT factor M=1.5.

- df is the wrong decision probability of a single (ne, ns) co-ordinate for the fail limit.  
It is found by simulation to be df = 2e-7.

- clp is the confidence level of a single (ne, ns) co-ordinate for the pass limit.  
It is found by simulation to be clp = 0.9999999.

- qnbinom(..): The inverse cumulative function of the negative binomial distribution.

The simulation works as follows:

- A large population of limit DUTs with true ER = 1e-5 is decided against the pass and fail limits.

- clp and df are tuned such that CL (99.999 %) of the population passes and D (0.001 %) of the population fails.

- A population of Bad DUTs with true ER = M\*1e-5 is decided against the same pass and fail limits.

- clp and df are tuned such that CL (99.999 %) of the population fails and D (0.001 %) of the population passes.

- The number of DUTs decrease during the simulation, as the decided DUTs leave the population. That number decreases with an approximately exponential characteristics. After 642 bad results all DUTs of the population are decided.

NOTE: The exponential decrease of the population is an optimal design goal for the decision co-ordinates (ne, ns), which can be achieved with other formulas or methods as well.

# G.5 Statistical Testing of NR sidelink Performance Requirements – Non concurrent

## G.5.1 General

To test PSCCH or PSSCH performance requirements the UE under test is required to send sidelink HARQ feedback on PSFCH based on corresponding PSSCH reception when PSFCH is configured in resource pool and sidelink HARQ function is enabled. The SS can use the PSFCH sent by the UE under test to determine a Pass or Fail decision. See G.5.2 for more details.

To test PSFCH performance requirements. PSFCH should be configured in resource pool and sidelink HARQ function should be enabled. The UE under test is required to keep sending PSSCH transport blocks when test loop function mode E (transmit mode) is activated as specified in TS 38.509 [22]. The SS shall sends appropriate sidelink HARQ feedback on PSFCH corresponds to each PSSCH. The UE shall retransmit PSSCH if it receives NACK on corresponding PSFCH. The SS can use the re-transmission sent by the UE under test to determine a Pass or Fail decision. See G.5.3 for more details.

The system simulator (SS) sends NR sidelink packets or PSFCH to the UE under test. The number of packets or PSFCH sent by the SS is predefined by the test time in G.5.4, G.5.5 and G.5.6 for requirements with PSSCH throughput, PSCCH miss-detection probability, and PSFCH miss-detection probability, respectively.

## G.5.2 Test method for PSCCH/PSSCH performance using sidelink HARQ feedback

Test method described in this subclause applies to the UE supporting *psfch-FormatZeroSidelink-r16*.

Figure G.5.2-1 descriptively represents the course of a test based in two metrics: the noise-normalized test SNR and the performance session, represented in terms of fractional throughput. The SS counts the sidelink HARQ feedback samples sent by the UE under test during performance session and calculate the performance metrics based on them. This effectively results on the discard of early sidelink HARQ feedback that might take place between their initialization at State 4-A and the stabilized performance session. The test method is as follows:

1) The UE is set on state 4-A with generic procedure parameters Test Loop Function = *On* according to TS 38.508-1 [6] clause 4.4A.2. The UE is configured as the receiving UE.

2) Once the UE is operating on state 4-A, the SNR is set to the test SNR level and the scheduling of sidelink packets starts. This takes place during the test procedure stage. The SS receives every sidelink HARQ feedback sent by the UE under test and starts to count the number of ACK/NACK/DTX (for ACK/NACK HARQ) or NACK/DTX (for NACK-only HARQ).

3) Once the scheduling of sidelink packets starts, the SS shall wait for a stability window of T=10 seconds before recoding the number of sidelink HARQ feedback sent by the UE under test.

4) Upon expiration of the stability window, the SS shall recode the number of ACK/NACK/DTX (for ACK/NACK HARQ) or NACK/DTX (for NACK-only HARQ) sent by the UE under test (Time Point A in Figure G.5.2-1). Then the performance session starts.

5) During the performance session the SS shall record the number of transmitted sidelink packets (PSCCH, PSSCH carrying SDAP SDU) starting in Time Point A and ending in Time Point B and keep counting the number of ACK/NACK/DTX (for ACK/NACK HARQ) or NACK/DTX (for NACK-only HARQ) sent by the UE under test. The performance session lasts for the Test Time defined in sections G.5.4 and G.5.5 for throughput and PSCCH miss-detection probability, respectively.

6) Once the Test Time is completed the SS shall recode the number of ACK/NACK/DTX (for ACK/NACK HARQ) or NACK/DTX (for NACK-only HARQ) sent by the UE under test (Time Point B in Figure G.5.2-1) and then stop counting. The SS shall use the retrieved counter values at Time Point A and Time Point B, as well as the recorded number of transmitted sidelink packets (PSCCH, PSSCH and/or SDAP SDU) between Time Point A and Time Point B, to calculate the PSCCH probability of miss-detection, the PSSCH BLER and the SDAP SDU loss, respectively.

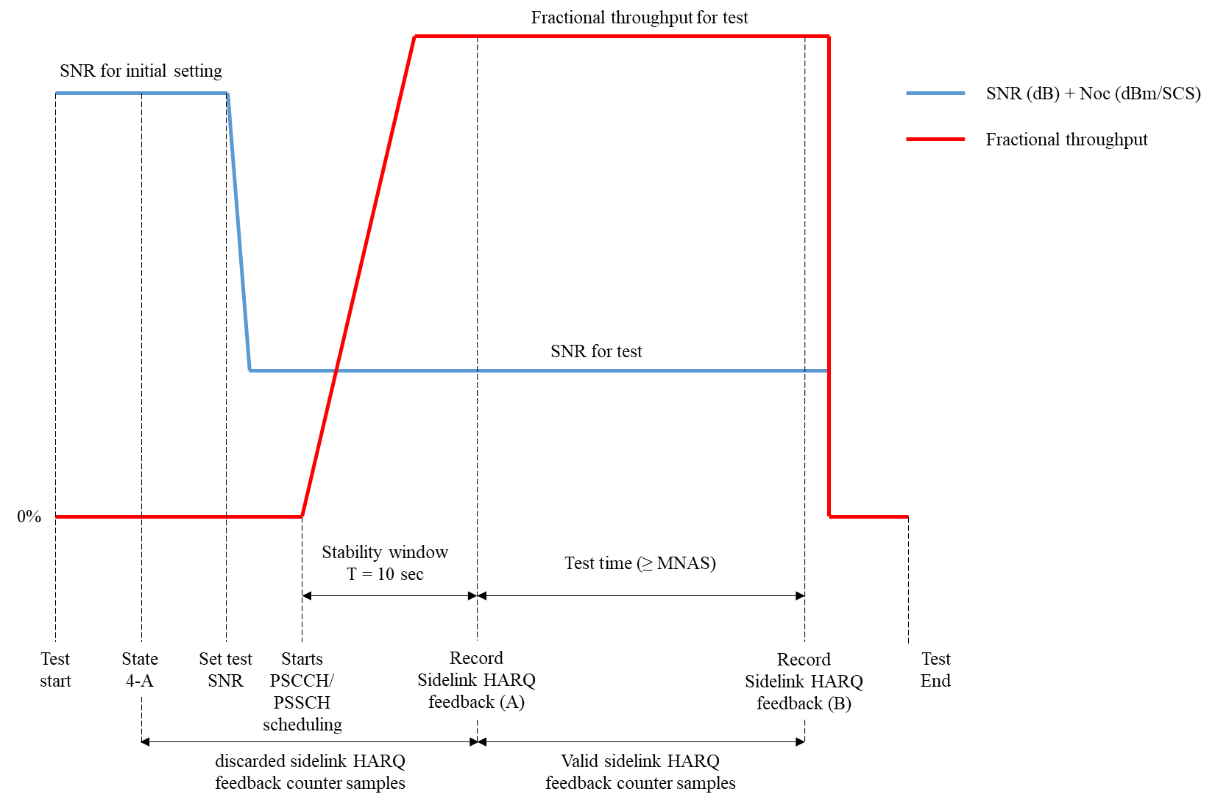


Figure G.5.2-1: Proposed Test Method for PSCCH/PSSCH performance using sidelink HARQ feedback

According to both the test method described in this section and Figure G.5.2-1, the PSCCH probability of miss-detection can be defined as follows when ACK/NACK HARQ or NACK-only HARQ is applied, respectively.

Similarly, we can define the PSSCH BLER as follows:

Finally, we can define the SDAP SDU loss as follows:

Where:

PMD = Probability of Miss-Detection

BLER = Block Error Rate

LossSDAP\_SDU = SDAP SDU Loss rate

NACKCounter = number of NACK feedback recorded by the SS

DTXCounter = number of DTX observed by the SS

SDAP\_SDUCounter = number of SDAP SDUs all of whose corresponding PSSCHs are correctly received (i.e. the SS receives positive acknowledgements on all corresponding PSFCHs)

T = 10 seconds stability window

PSCCHTransmitted = Transmitted number of PSCCH transport blocks counted by the SS

PSSCHTransmitted = Transmitted number of PSSCH transport blocks counted by the SS

STCH\_SDUTransmitted = Transmitted number of STCH PDCP SDUs counted by the SS

MNAS = Minimum Number of Active Subframes, as per Table G.5.4-1 and Table G.5.5-1 for performance tests with throughput and probability of miss-detection, respectively

## G.5.3 Test method for PSFCH performance

Figure G.5.2-1 descriptively represents the course of a test based in two metrics: the noise-normalized test SNR and the performance session, represented in terms of fractional throughput. The SS counts the re-transmissions samples sent by the UE under test during performance session and calculate the performance metrics based on them. This effectively results on the discard of early re-transmission that might take place between their initialization at State 4-A and the stabilized performance session. The test method is as follows:

1) The UE is set on state 4-A with generic procedure parameters Test Loop Function = *On* according to TS 38.508-1 [6] clause 4.4A.2. The UE is configured as the transmitting UE.

2) Once the UE is operating on state 4-A, the SNR is set to the test SNR level. This takes place during the test procedure stage. The SS receives and counts every PSCCH/PSSCH sent by the UE under test, then send ACK/NACK/DTX on corresponding PSFCH according to setting in test case.

3) Once the test SNR level is set, the SS shall wait for a stability window of T=10 seconds before recoding the number of sidelink HARQ feedback sent by the UE under test.

4) Upon expiration of the stability window, the SS shall recode the number of re-transmissions sent by the UE under test (Time Point A in Figure G.5.2-1). Then the performance session starts.

5) During the performance session the SS shall record the number of transmitted sidelink HARQ feedback (ACK, NACK and DTX) starting in Time Point A and ending in Time Point B and keep counting the number of re-transmission sent by the UE under test. The performance session lasts for the Test Time defined in sections G.5.6 for PSFCH miss-detection probability, respectively.

6) Once the Test Time is completed the SS shall recode the number of re-transmissions sent by the UE under test (Time Point B in Figure G.5.2-1) and then stop counting. The SS shall use the retrieved counter values at Time Point A and Time Point B, as well as the recorded number of transmitted sidelink HARQ feedbacks (ACK, NACK and DTX) between Time Point A and Time Point B, to calculate the PSFCH probability of miss-detection.

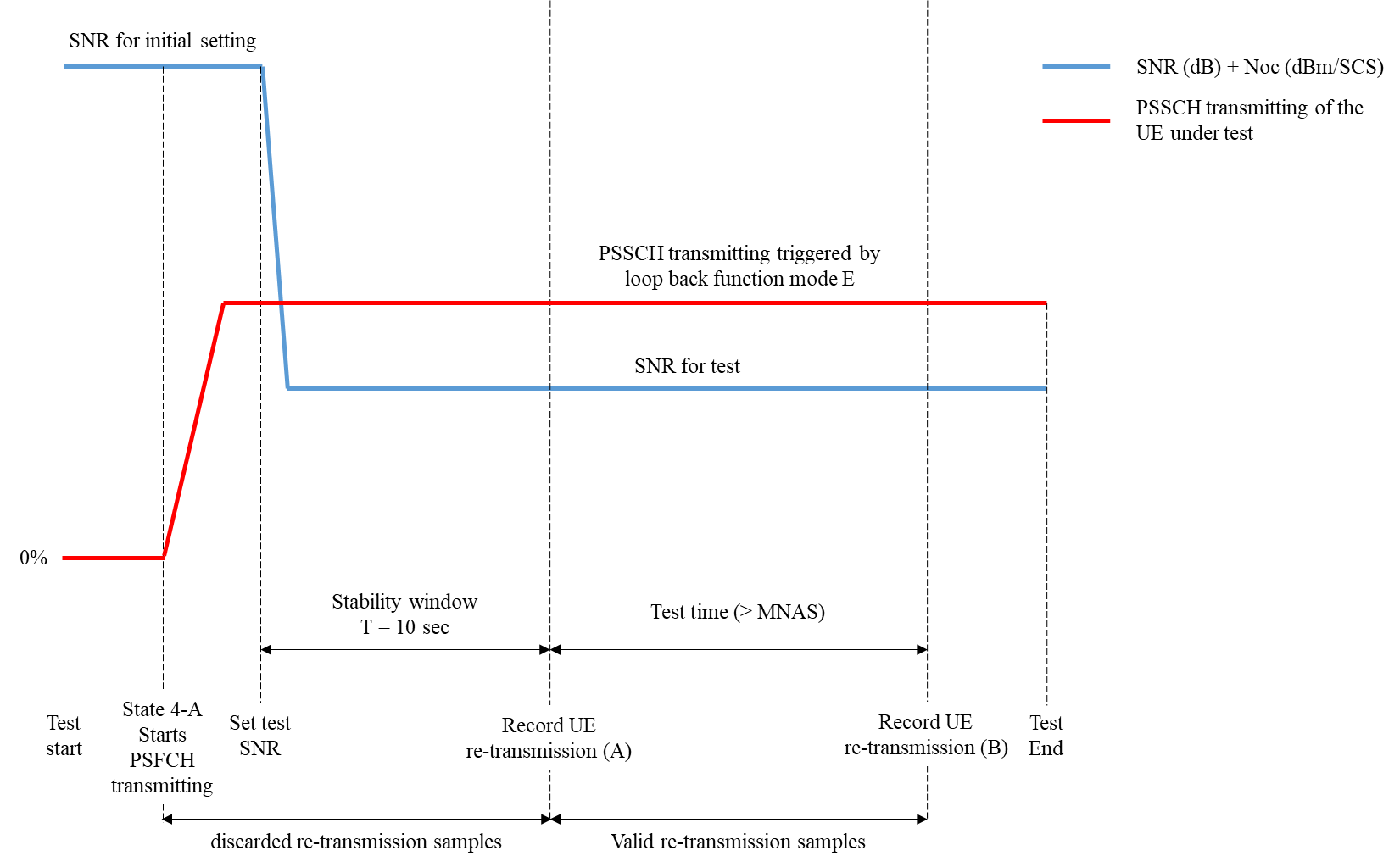


Figure G.5.3-1: Proposed Test Method for PSFCH performance

According to both the test method described in this section and Figure G.5.3-1, the PSFCH probability of miss-detection can be defined as follows when ACK/NACK HARQ or NACK-only HARQ is applied, respectively.

When NACK-only HARQ is applied, the DTX to NACK probability defined in TS 38.101-4 [5] clause 11.1.5.1.1.2 can be defined as follows:

When ACK/NACK HARQ is applied, the success detection probability of ACK can be defined as follows:

And the success detection probability of NACK/DTX can be defined as follows:

Where:

PMD = Probability of Miss-Detection

PSD = Probability of success detection

ReTxACK = number of re-transmissions corresponding to the ACK sent by the SS.

ReTxNACK = number of re-transmissions corresponding to the NACK sent by the SS.

ReTxDTX = number of re-transmissions corresponding to the DTX sent by the SS.

NACKCounter = number of ACK feedback sent by the SS

NACKCounter = number of NACK feedback sent by the SS

DTXCounter = number of PSFCH occasions on which SS chooses to send nothing

T = 10 seconds stability window

MNAS = Minimum Number of Active Subframes, as per Table G.5.6-1 for PSFCH probability of miss-detection.

## G.5.4 Test time for PSSCH performance requirements with throughput

The throughput requirements are tested in terms of PSSCH BLER. The maximum BLER requirement for all tests is 10%. The tests are performed in a variety of AWGN and fading propagation models. For each test in Table G.5.4-1 the test time (in subframes) is to be applied to the test method described in section G.5.2

Table G.5.4-1: Minimum test time for PSSCH performance requirements with throughput

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test  **num.** | **Performance Scenario** | **Minimum Number of Active Subframes (MNAS)** | **Minimum Number of Subframes (MNS)(Note 1)** | **Test Time in Subframes (Note 2)** |
| 11.1.2-1 | R.PSSCH.2-1.1  1x2 Low  TDLA30-2700 | FFS | FFS | FFS |
| 11.1.2-2 | R.PSSCH.2-1.2  1x2 Low  TDLA30-1400 | FFS | FFS | FFS |
| 11.1.2-3 | R.PSSCH.2-1.3  1x2 Low  TDLA30-180 | FFS | FFS | FFS |
| 11.1.6-1 | R.PSSCH.2-1.4  1x2 Low  AWGN  2 PSSCH transmissions | FFS | FFS | FFS |
| 11.1.7-1 | R.PSSCH.2-1.5  1x2 Low  AWGN  Number of PSSCH transmissions depends on UE capability | FFS | FFS | FFS |
| Note 1: The Minimum Number of Subframes is the total minimum number of subframes (active and inactive) required for this demodulation scenario and is derived from the MNAS, according to the resource pool configuration defined for each test case.  Note 2: The Test Time is based on the Minimum Number of Subframes (MNS) according to the formula: Test Time in Subframes = 1000\*CEIL(MNS/1000). | | | | |

## G.5.5 Test time for PSCCH performance requirements with miss-detection probability

The probability of miss-detection requirements are tested in terms of Probability of PSCCH miss-detection. The maximum Probability of PSCCH miss-detection for all tests is 1%. The tests are performed in a variety of Static, AWGN and fading propagation models. For each test in Table G.5.5-1 the Test Time in Subframes is to be applied to the test method described in section G.5.2.

Table G.5.5-1: Minimum Test Time for PSCCH Performance Requirements with Probability of Miss-Detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test  **num.** | **Performance Scenario** | **Minimum Number of Active Subframes (MNAS)** | **Minimum Number of Subframes (MNS)(Note 1)** | **Test Time in Subframes (Note 2)** |
| 11.1.3-1 | R.PSCCH.2-1.1  20 / 30  1x2 Low  TDLA30-1400 | FFS | FFS | FFS |
| 11.1.8-1 | R.PSCCH.2-1.1  40 / 30  1x2 Low  Static | FFS | FFS | FFS |
| Note 1: The Minimum Number of Subframes is the total minimum number of subframes (active and inactive) required for this demodulation scenario and is derived from the MNAS, according to the resource pool configuration defined for each test case.  Note 2: The Test Time is based on the Minimum Number of Subframes (MNS) according to the formula: Test Time in Subframes = 1000\*CEIL(MNS/1000). | | | | |

## G.5.6 Test time for PSFCH performance requirements with miss-detection probability

The probability of miss-detection requirements are tested in terms of Probability of PSFCH miss-detection. The maximum Probability of PSFCH miss-detection for all tests is 1%. The tests are performed in a variety of Static, AWGN and fading propagation models. For each test in Table G.5.6-1 the Test Time in Subframes is to be applied to the test method described in section G.5.3.

Table G.5.6-1: Minimum Test Time for PSFCH Performance Requirements with Probability of Miss-Detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test  **num.** | **Performance Scenario** | **Minimum Number of Active Subframes (MNAS)** | **Minimum Number of Subframes (MNS)(Note 1)** | **Test Time in Subframes (Note 2)** |
| 11.1.5-1 | 20 / 30  1x2 Low  TDLA30-180 | FFS | FFS | FFS |
| 11.1.9-1 | 40 / 30  1x2 Low  Static | FFS | FFS | FFS |
| Note 1: The Minimum Number of Subframes is the total minimum number of subframes (active and inactive) required for this demodulation scenario and is derived from the MNAS, according to the resource pool configuration defined for each test case.  Note 2: The Test Time is based on the Minimum Number of Subframes (MNS) according to the formula: Test Time in Subframes = 1000\*CEIL(MNS/1000). | | | | |

Annex H:  
Approach for finding UE direction for FR2 Demod and CSI Testing

## H.0 Normative criteria for determining UE direction for Demod and CSI

Following 3 criteria shall be satisfied for a given UE direction. Procedure for finding the UE direction is captured in Annex H.1

1. UE shall pass the REFSENS test as per TC 7.3.2 of TS 38.521-2 [8].

2. Minimum isolation requirement of 12 dB between the 2 TE polarization branches shall be met.

3. UE reported rank shall be higher or same as intended rank for a given test.

## H.1 Procedure for finding UE direction

This section provides example approaches for finding the UE direction for Demod and CSI tests. Other approaches satisfying the normative criteria listed in H.0 are not precluded.

Default approach is as defined in H.1.2.

### H.1.1 Using Rx beam peak direction search

1. For Rx beam peak direction search, please refer to procedure defined in Annex K.1.2/K.3.2 of TS 38.521-2 [8].

2. Run wireless cable mode isolation procedure as defined in H.2.

3. Ensure UE reported rank is higher or same as intended rank for a given test.

### H.1.2 RSRPB based scan with fallback option to Rx beam peak direction search

1. Enable periodic RSRPB reporting from the UE.

2. Set of grid points for the UE scan can be user defined set or entire sphere.

3. For each grid point, record RSRPB first by connecting SS to the DUT through the measurement antenna with PolLink=  polarization to form the Rx beam towards the measurement antenna and similarly for PolLink=  polarization.

4. Wait for BEAM\_SELECT\_WAIT\_TIME before recording the RSRPB reports.

5. Once the grid points scan is completed, sort the grid points based on the linear sum of 4 RSRPB values (2 each for  and  polarization).

6. For the top [10] grid points, run the REFSENS throughput test as per the test condition defined in 38.521-2 clause 7.3.2

7. Grid points that pass the REFSENS throughput test are the potential UE direction to be used for running the tests.

8. If no grid points found in step 7, fall back to using H.1.1.

9. For running rank1 tests,

a. Pick any of the grid points obtained in step 7.

b. Run the wireless cable isolation procedure defined in H.2.

c. Exit the procedure.

10. For running rank2 tests,

a. Pick a grid point obtained in step 7.

b. Run the wireless cable mode isolation procedure defined in H.2.

c. If the grid point satisfies the minimum isolation, proceed to RI check.

Enable RI reporting from UE. If the UE reported rank = 2, exit the procedure.

If UE reported rank is not equal to 2, move to the next grid from step 7 and run step 10.

d. If no grid point meets the criteria in step 7 and step 10c, fallback to using H.1.1.

### H.1.3 Isolation based scan with fallback option to Rx beam peak direction search

1. Enable periodic RSRPB reporting from the UE.

2. Set of grid points for the UE scan can be user defined set or entire sphere.

3. For each grid point, record RSRPB first by connecting SS to the DUT through the measurement antenna with PolLink=  polarization to form the Rx beam towards the measurement antenna and similarly for PolLink=  polarization.

4. Wait for BEAM\_SELECT\_WAIT\_TIME before recording the RSRPB reports.

5. Once the grid points scan is completed, sort the grid points based on the highest ISO,B1 and ISO,B2 or ISO,B2 and ISO,B1 (ISO,B1, ISO,B2, ISO,B2 and ISO,B1 are explained in H.2).

6. For the top [10] grid points, run the REFSENS throughput test as per the test condition defined in 38.521-2 clause 7.3.2

7. Grid points that pass the REFSENS throughput test are the potential UE direction to be used for running the tests.

8. If no grid points found in step 7, fall back to using H.1.1.

9. For running rank1 tests,

a. Pick any of the grid points obtained in step 7.

b. If the grid point satisfies the minimum isolation, exit the procedure.

10. For running rank2 tests,

a. Pick a grid point obtained in step 7.

b. If the grid point satisfies the minimum isolation, proceed to RI check.

Enable RI reporting from UE. If the UE reported rank = 2, exit the procedure.

If UE reported rank is not equal to 2, move to the next grid from step 7 and run step 10.

d. If no grid point meets the criteria in step 7 and step 10b, fallback to using H.1.1.

## H.2 Wireless cable mode isolation procedure

The following procedure shall be used to verify the wireless cable mode has been established and that the minimum isolation has been achieved

1. Select any of the three Alignment Options (1, 2, or 3) to mount the DUT inside the QZ.

2. If the re-positioning concept is applied to demodulation test cases, position the DUT in DUT Orientation 1 if the RX beam peak is within 0o≤≤90o. Otherwise, position the DUT in DUT Orientation 2 (Option 1 or 2). If the re-positioning concept is not applied to demodulation test cases, position the DUT in DUT Orientation 1

3. Connect the SS (System Simulator) using static propagation conditions with the DUT through the measurement antenna with PolLink= polarization to form the RX beam towards the desired test direction. Allow at least BEAM\_SELECT\_WAIT\_TIME for the UE RX beam selection to complete.

4. Adjust the DL power of the SS to obtain PDL defined in Table C.0.2-1 at the centre of QZ

5. Perform the isolation of the branches to achieve the wireless cable mode. The inverse channel matrix approach in [4] is one suitable approach. Alternate approaches are not precluded.

6. To verify the wireless cable mode and thus the min. isolation between branches

a) Query SS-RSRPB(PolMeas=PolLink=) from the DUT for the -polarization and convert the two measurements in dBm, i.e., SS-RSRPBB1 and SS-RSRPBB2

b) Calculate the isolation from -polarization into Branch 1, i.e., ISO,B1 = SS-RSRPBB1 - SS-RSRPBB2 and the isolation into Branch 2, i.e., ISO,B2 = SS-RSRPBB2 - SS-RSRPBB1

c) Connect the SS (System Simulator) using static propagation conditions with the DUT through the measurement antenna with PolLink= polarization to form the RX beam towards desired test direction. Allow at least BEAM\_SELECT\_WAIT\_TIME for the UE RX beam selection to complete.

d) Adjust the DL power of the SS to obtain PDL defined in Table C.0.2-1 at the centre of QZ

e) Query SS-RSRPB(PolMeas=PolLink=) from the DUT for -polarization and convert the two measurements in dBm, i.e., SS-RSRPBB1 and SS-RSRPBB2

f) Calculate the isolation from -polarization into Branch 2, i.e., ISO,B2 = SS-RSRPBB2 - SS-RSRPBB1 and the isolation into Branch 1, i.e., ISO,B1 = SS-RSRPBB1 - SS-RSRPBB2

If either of the isolations pairs, ISO,B1 and ISO,B2 or ISO,B2 and ISO,B1 exceed 12dB, the wireless cable mode has been achieved.

Annex I (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **Tdoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2018-01 |  | R5-180064 |  |  |  | Skeleton for NR Demod spec | 0.0.1 |
| 2018-04-13 |  | R5-182036 |  |  |  | Added the test procedure for FR2 Demod testing in Annex | 0.1.0 |
| 2018-10-12 |  | R5-185903 |  |  |  | Added the demod spec test case section titles to be in line with RAN4 approved skeleton for 38.101-4 | 0.1.1 |
| 2018-11-20 | RAN5 #81 | R5-188006 |  |  |  | new TC for PDSCH FR1 demod | 0.2.0 |
| 2018-11-20 | RAN5 #81 | R5-188008 |  |  |  | new TC for PDSCH FR2 demod | 0.2.0 |
| 2018-11-20 | RAN5 #81 | R5-187573 |  |  |  | section 3 of 38.521-4 spec | 0.2.0 |
| 2018-11-20 | RAN5 #81 | R5-187845 |  |  |  | section 4 of 38.521-4 spec | 0.2.0 |
| 2018-11-20 | RAN5 #81 | R5-188009 |  |  |  | pCR for new TC addition for FR1 FDD PDSCH Demod | 0.2.0 |
| 2018-11-20 | RAN5 #81 | R5-188010 |  |  |  | pCR for new TC addition for FR1 FDD PDCCH Demod | 0.2.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190054 |  |  |  | update to 2Rx TDD FR1 PDSCH mapping Type A performance test case | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190926 |  |  |  | pCR for new TC addition for FR1 4Rx FDD PDSCH Demodulation performance (2x4) | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190927 |  |  |  | pCR for new TC addition for FR1 4Rx FDD PDSCH Demodulation performance (4x4) | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190928 |  |  |  | pCR for new TC addition for FR1 4Rx FDD PDSCH Demodulation performance with enhanced receiver type X (4x4) | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190291 |  |  |  | Updated to Annex A Measurement Channels for Performance tests | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190292 |  |  |  | Updated to Annex B Propagation conditions for Performance tests | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190458 |  |  |  | update to 2Rx TDD FR2 PDSCH mapping Type A performance test case | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190461 |  |  |  | 2Rx TDD FR2 PDCCH performance test case | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190929 |  |  |  | LTE link setup details for demod test cases | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190930 |  |  |  | Annex for statistical tput calculation for demod test cases | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190931 |  |  |  | pCR for TC addition of FR1 TDD 4Rx PDSCH | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190932 |  |  |  | pCR for modification of FDD 2Rx FR1 PDSCH Demod | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190933 |  |  |  | Annex for DL and UL Signal Setup | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190934 |  |  |  | pCR for modification of FDD FR1 PDCCH Demod | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190935 |  |  |  | PDSCH and PDCCH Config before measurement | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190986 |  |  |  | 38.521-4 Common Section updates to clarify leverage across architecture options | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190552 |  |  |  | Addition of 2Rx TDD FR1 Single PMI tests for both SA and NSA | 0.3.0 |
| 2019-01-25 | RAN5 5G-NR AH#4 | R5-190553 |  |  |  | Addition of 2Rx TDD FR1 RI reporting for both SA and NSA | 0.3.0 |
| 2019-03-01 | RAN5 #82 | R5-191183 |  |  |  | Adding relevant references to 38.521-4 | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192461 |  |  |  | Adding of test case 6.2.2.1.2.1.2, Rx FDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192672 |  |  |  | Introduction of New test case 5.3.2.2.1 2Rx TDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192463 |  |  |  | Introduction of New test case 5.3.2.2.2 2Rx TDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192462 |  |  |  | Introduction of New test case 5.3.3.1.1 4Rx FDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192464 |  |  |  | Introduction of New test case 5.3.3.1.2 4Rx FDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192465 |  |  |  | Introduction of New test case 5.3.3.2.1 4Rx TDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192465 |  |  |  | Introduction of New test case 5.3.3.2.2 4Rx TDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192474 |  |  |  | Introduction of TS 38.521-4 test case 6.3.2.1.1 | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192475 |  |  |  | Introduction of TS 38.521-4 test case 6.3.2.1.2 | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192467 |  |  |  | Introduction of test case 5.2.2.1.2\_1, 2Rx FDD FR1 PDSCH mapping Type A and CSI-RS overlapped with PDSCH performance - 2x2 MIMO with baseline receiver for both SA and NSA | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192840 |  |  |  | Demod spec section 4 update | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192673 |  |  |  | Update to TDD FR1 2Rx PDSCH Type A test case | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192103 |  |  |  | addition of 2Rx TDD FR1 periodic CQI reporting test case | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192468 |  |  |  | pCR for addition of 2Rx TDD FR1 TypeA and CSI-RS overlapped TC | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192866 |  |  |  | pCR for modification of PDSCH and PDCCH Config before measurement | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192470 |  |  |  | pCR for modification of FDD FR1 PDCCH Demod | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192471 |  |  |  | pCR for modification of FDD 2Rx FR1 PDSCH Demod | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192472 |  |  |  | Update to 2Rx TDD FR1 RI reporting for both SA and NSA | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192460 |  |  |  | Minimum test time update for FR1 Demod test case | 0.4.0 |
| 2019-03-01 | RAN5 #82 | R5-192473 |  |  |  | Addition of Annex F for Demod spec | 0.4.0 |
| 2019-03 | RAN#83 | RP-190222 | - | - | - | Presented to the RAN#83 plenary for 1-step approval | 1.0.0 |
| 2019-03 | RAN#83 | - | - | - | - | raised to v15.0.0 with editorial changes only | 15.0.0 |
| 2019-06 | RAN5#83 | R5-193544 | 0030 | - | F | Updates to test case 6.2.2.1.2.1, 2Rx FDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | 15.1.0 |
| 2019-06 | RAN5#83 | R5-193943 | 0035 | - | F | Adding test case 6.2.2.2.2.2, 2Rx TDD FR1 periodic subband CQI reporting under fading conditions for both SA and NSA | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194159 | 0048 | - | F | Alignment of Annex C with core specification | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194466 | 0056 | - | F | Introduction of FR1 CQI test case 6.2.2.2.2.1 | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194622 | 0057 | - | F | Corrections TDD UL-DL configurations | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194680 | 0066 | - | F | Demod section 5 general update | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194689 | 0073 | - | F | Addition of text for FR1 PBCH demodulation test case | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194690 | 0074 | - | F | Update to 2Rx TDD FR2 PDSCH Type A test case | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194691 | 0075 | - | F | Update to FR2 PDCCH config param | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194692 | 0076 | - | F | Addition of text for FR2 PBCH demodulation test case | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194693 | 0077 | - | F | Update to section 8 CSI reporting | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194979 | 0063 | 1 | F | Further updates to 2Rx TDD FR1 PDSCH mapping Type A test case | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194980 | 0032 | 1 | F | Introduction of TC 6.4.3.2\_1 4Rx TDD FR1 RI reporting for both SA and NSA | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194981 | 0034 | 1 | F | Adding test case 6.2.2.1.2.2, 2Rx FDD FR1 periodic subband CQI reporting under fading conditions for both SA and NSA | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194982 | 0053 | 1 | F | Update to 4Rx FDD FR1 PDSCH mapping Type A performance 4x4 MIMO with baseline Rx | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194983 | 0054 | 1 | F | Update to 4Rx FDD FR1 PDSCH mapping Type A performance 4x4 MIMO with enhanced Rx | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194984 | 0037 | 1 | F | Editorial changes to TS 38.521-4 test case 6.3.2.1.2 | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194985 | 0038 | 1 | F | Introduction to TS 38.521-4 test case 6.3.3.1.1 | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194986 | 0039 | 1 | F | Introduction to TS 38.521-4 test case 6.3.3.1.2 | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194987 | 0040 | 1 | F | Introduction to TS 38.521-4 test case 6.3.3.2.1 | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194988 | 0041 | 1 | F | Introduction to TS 38.521-4 test case 6.3.3.2.2 | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194989 | 0059 | 1 | F | Modification of 2Rx FDD FR1 PDSCH mapping Type A performance - enhanced Rx | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194990 | 0060 | 1 | F | Modification of 2Rx TDD FR1 PDSCH mapping Type A and CSI-RS overlapped with PDSCH performance - baseline Rx | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194991 | 0061 | 1 | F | Modification of 2Rx FDD FR1 PDCCH 1 Tx | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194992 | 0062 | 1 | F | Modification of 2Rx FDD FR1 PDCCH 2 Tx | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194993 | 0042 | 1 | F | Update to test case 5.3.2.2.1 2Rx TDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194994 | 0043 | 1 | F | Update to test case 5.3.2.2.2 2Rx TDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194995 | 0044 | 1 | F | Update to test case 5.3.3.1.1 4Rx FDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194996 | 0045 | 1 | F | Update to test case 5.3.3.1.2 4Rx FDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194997 | 0046 | 1 | F | Update to test case 5.3.3.2.1 4Rx TDD FR1 PDCCH 1 Tx antenna performance for both SA and NSA | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194998 | 0047 | 1 | F | Update to test case 5.3.3.2.2 4Rx TDD FR1 PDCCH 2 Tx antenna performance for both SA and NSA | 15.1.0 |
| 2019-06 | RAN5#83 | R5-194999 | 0055 | 1 | F | Update to FR1 demod test case 5.2.2.1.2\_1 | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195000 | 0078 | 1 | F | Update to RI Reporting Accuracy test | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195001 | 0049 | 1 | F | Updated to Annexes for performance tests | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195002 | 0068 | 1 | F | Demod section 2-4 update | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195003 | 0058 | 1 | F | Modification of 2Rx FDD FR1 PDSCH mapping Type A performance - baseline Rx | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195088 | 0029 | 1 | F | Editorial Aligning CSI common test parameters with core specification | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195089 | 0031 | 1 | F | Updating of E-UTRA test frequency for DEMOD test cases | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195098 | 0079 | - | F | Performance implementation of FR2 UL demod OTA tests using single pol Rx TE | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195170 | 0052 | 1 | F | Update to 4Rx FDD FR1 PDSCH mapping Type A performance 2x4 MIMO with baseline Rx | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195171 | 0033 | 1 | F | Introducing MU and TT clauses in annex F for Channel State Information reporting test cases | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195172 | 0069 | 1 | F | Annex update for PDSCH PDCCH minimum test time | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195413 | 0067 | 1 | F | Update to section 9 and 10 of Demod spec | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195438 | 0050 | 2 | F | Introducing 5.2.2.1.4\_1 2Rx FDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195439 | 0051 | 2 | F | Introducing 5.2.3.1.4\_1 4Rx FDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195440 | 0064 | 1 | F | Addition of new test case for 2Rx FDD FR1 periodic CQI reporting under AWGN | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195441 | 0065 | 1 | F | Update to 2Rx TDD FR1 periodic CQI reporting under AWGN | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195442 | 0070 | 1 | F | Addition of SDR test case for single carrier in SA mode | 15.1.0 |
| 2019-06 | RAN5#83 | R5-195443 | 0072 | 1 | F | Addition of FR1 SDR test case for CA in NSA mode | 15.1.0 |
| 2019-06 | RAN#84 | - | - | - | - | Administrative release upgrade to match the release of 3GPP TS 38.508-1 and TS 38.521-1 which were upgraded at RAN#84 to Rel-16 due to Rel-16 relevant CR(s) | 16.0.0 |
| 2019-09 | RAN#85 | R5-195558 | 0080 | - | F | Correction to 5.2.2.1.4\_1 2Rx FR1 PDSCH LTE-NR coexistence performance | 16.1.0 |
| 2019-09 | RAN#85 | R5-196245 | 0090 | - | F | Correction to 2Rx TDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | 16.1.0 |
| 2019-09 | RAN#85 | R5-196247 | 0092 | - | F | Correction to 5.3.2.2.1 and 5.3.3.2.1 TDD FR1 PDCCH 1Tx performance | 16.1.0 |
| 2019-09 | RAN#85 | R5-196495 | 0097 | - | F | Updated to Annex A for performance tests | 16.1.0 |
| 2019-09 | RAN#85 | R5-196496 | 0098 | - | F | Updated to Annex B for performance tests | 16.1.0 |
| 2019-09 | RAN#85 | R5-196498 | 0100 | - | F | Updated to General clauses for Demod and CSI requirements | 16.1.0 |
| 2019-09 | RAN#85 | R5-196857 | 0119 | - | F | Corrections to PDSCH demod TCs | 16.1.0 |
| 2019-09 | RAN#85 | R5-197370 | 0086 | 1 | F | Updates to 6.2.2.1.2.1, 2Rx FDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | 16.1.0 |
| 2019-09 | RAN#85 | R5-197371 | 0087 | 1 | F | Updates to 6.2.2.2.2.1, 2Rx TDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | 16.1.0 |
| 2019-09 | RAN#85 | R5-197372 | 0125 | 1 | F | Modification of 4Rx FDD FR1 PDSCH mapping Type A performance - 2x4 MIMO with baseline receiver for both SA and NSA | 16.1.0 |
| 2019-09 | RAN#85 | R5-197373 | 0084 | 1 | F | Clean up test cases 5.3.3.1.1, 5.3.3.1.2, 5.3.3.2.1 and 5.3.3.2.2 for 4Rx PDCCH | 16.1.0 |
| 2019-09 | RAN#85 | R5-197374 | 0099 | 1 | F | Updated to General clauses for performance tests | 16.1.0 |
| 2019-09 | RAN#85 | R5-197375 | 0123 | 1 | F | Modification of FDD FR1 2Rx TypeA baseline and TypeX Rxvr | 16.1.0 |
| 2019-09 | RAN#85 | R5-197376 | 0083 | 1 | F | Clean up test cases 5.3.2.2.1 and 5.3.2.2.2 for 2Rx PDCCH | 16.1.0 |
| 2019-09 | RAN#85 | R5-197377 | 0093 | 1 | F | Correction to FR1 FDD PDSCH mapping Type A performance test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197378 | 0095 | 1 | F | Correction to MU and TT for FR1 demodulation test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197379 | 0096 | 1 | F | Update to 4Rx FDD FR1 PDSCH mapping Type A performance | 16.1.0 |
| 2019-09 | RAN#85 | R5-197380 | 0117 | 1 | F | Update of Annex F to add new CSI test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197512 | 0101 | 1 | F | Update to SA SDR test case | 16.1.0 |
| 2019-09 | RAN#85 | R5-197513 | 0102 | 1 | F | Update to NSA SDR test case | 16.1.0 |
| 2019-09 | RAN#85 | R5-197566 | 0127 | 1 | F | Modification on 2Rx TDD FR1 Single PMI with 4Tx Type1 - SinglePanel codebook for both SA and NSA | 16.1.0 |
| 2019-09 | RAN#85 | R5-197567 | 0128 | 1 | F | Introduce 2Rx TDD FR1 Single PMI with 8Tx Type1 - SinglePanel codebook for both SA and NSA | 16.1.0 |
| 2019-09 | RAN#85 | R5-197572 | 0126 | 1 | F | Modification of 4Rx FDD FR1 PDSCH mapping Type A performance - 4x4 MIMO with baseline receiver for both SA and NSA | 16.1.0 |
| 2019-09 | RAN#85 | R5-197573 | 0091 | 1 | F | Correction to 2Rx TDD FR1 PDSCH mapping Type A performance | 16.1.0 |
| 2019-09 | RAN#85 | R5-197574 | 0105 | 1 | F | Update to TDD FR1 2Rx TypeA Baseline and Type X receiver Demod test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197575 | 0107 | 1 | F | Editorial and updates to TS 38.521-4 test case 6.3.2.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197576 | 0108 | 1 | F | Updates to TS 38.521-4 test case 6.3.2.1.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197577 | 0109 | 1 | F | Updates to TS 38.521-4 test case 6.3.3.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197578 | 0110 | 1 | F | Update to TS 38.521-4 test case 6.3.3.1.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197579 | 0111 | 1 | F | Editorial and update to TS 38.521-4 test case 6.3.3.2.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197580 | 0112 | 1 | F | Editorial and update to TS 38.521-4 test case 6.3.3.2.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197581 | 0120 | 1 | F | Correction of PRACH-ConfigurationIndex for TC 5.2.2.2.1\_1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197582 | 0122 | 1 | F | Update to RI Reporting Accuracy test | 16.1.0 |
| 2019-09 | RAN#85 | R5-197615 | 0088 | 1 | F | Updates to 6.2.2.1.2.2, 2Rx FDD FR1 periodic subband CQI reporting under fading conditions for both SA and NSA | 16.1.0 |
| 2019-09 | RAN#85 | R5-197616 | 0089 | 1 | F | Updates to 6.2.2.2.2.2, 2Rx TDD FR1 periodic subband CQI reporting under fading conditions for both SA and NSA | 16.1.0 |
| 2019-09 | RAN#85 | R5-197648 | 0115 | 2 | F | Update to Annex G to restructure minimum test time tables for Demodulation test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197649 | 0116 | 2 | F | Update to Annex G to add minimum test time for CSI test cases | 16.1.0 |
| 2019-12 | RAN#86 | R5-198248 | 0141 | - | F | Updates to Annex F | 16.2.0 |
| 2019-12 | RAN#86 | R5-198281 | 0142 | - | F | Update to FR1 4Rx FDD PDSCH Type A Demodulation performance | 16.2.0 |
| 2019-12 | RAN#86 | R5-198395 | 0151 | - | F | Corrections to E-UTRA configurations for EN-DC test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-198407 | 0152 | - | F | Correction to 2Rx FDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | 16.2.0 |
| 2019-12 | RAN#86 | R5-198408 | 0153 | - | F | Correction to 2Rx and 4Rx TDD FR1 Single PMI with 4Tx Type1 - SinglePanel codebook for both SA and NSA | 16.2.0 |
| 2019-12 | RAN#86 | R5-198409 | 0154 | - | F | Correction to Sections 5.2 and 5.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198560 | 0157 | - | F | Updated to Annex A and B for performance tests | 16.2.0 |
| 2019-12 | RAN#86 | R5-198679 | 0161 | - | F | Correction of SchedulingRequestResourceConfig periodicityAndOffset for TC 7.2.2.2.1\_1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198680 | 0162 | - | F | Include PDSCH RMC for PDCCH demod FR1 test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-199079 | 0137 | 2 | F | Adding new test case 6.2.3.1.2.1, 4Rx FDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | 16.2.0 |
| 2019-12 | RAN#86 | R5-199382 | 0129 | 1 | F | Addition of 5.2.2.1.3\_1 2Rx FDD PDSCH mapping Type B | 16.2.0 |
| 2019-12 | RAN#86 | R5-199383 | 0130 | 1 | F | Addition of NR test case 5.2.3.1.2\_1-FDD type A CSI-RS overlap 4x4 MIMO | 16.2.0 |
| 2019-12 | RAN#86 | R5-199384 | 0134 | 1 | F | Addition of NR test case 6.2.3.1.1.1-FDD periodical CQI | 16.2.0 |
| 2019-12 | RAN#86 | R5-199385 | 0136 | 1 | F | Addition of NR test case 6.4.2.1\_1-FDD RI reporting | 16.2.0 |
| 2019-12 | RAN#86 | R5-199387 | 0149 | 1 | F | Update to starting MCS index for CQI reporting test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-199388 | 0145 | 1 | F | Update to Annex G for minimum test time for FR2 Demod test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-199414 | 0131 | 1 | F | Addition of NR test case 5.2.3.1.3\_1-FDD type B 2x4 MIMO | 16.2.0 |
| 2019-12 | RAN#86 | R5-199415 | 0132 | 1 | F | Addition of NR test case 5.2.3.2.2\_1-TDD type A CSI-RS overlap 2x4 MIMO | 16.2.0 |
| 2019-12 | RAN#86 | R5-199416 | 0133 | 1 | F | Addition of NR test case 5.2.3.2.3\_1-TDD type B 2x4 MIMO | 16.2.0 |
| 2019-12 | RAN#86 | R5-199417 | 0135 | 1 | F | Addition of NR test case 6.2.3.2.1.1-TDD periodical CQI | 16.2.0 |
| 2019-12 | RAN#86 | R5-199418 | 0138 | 1 | F | Adding new test case 6.2.3.1.2.2, 4Rx FDD FR1 aperiodic subband CQI reporting under fading conditions for both SA and NSA | 16.2.0 |
| 2019-12 | RAN#86 | R5-199419 | 0139 | 1 | F | Adding new test case 6.2.3.2.2.1, 4Rx TDD FR1 periodic wideband CQI reporting under fading conditions for both SA and NSA | 16.2.0 |
| 2019-12 | RAN#86 | R5-199420 | 0140 | 1 | F | Adding new test case 6.2.3.2.2.2, 4Rx TDD FR1 aperiodic subband CQI reporting under fading conditions for both SA and NSA | 16.2.0 |
| 2019-12 | RAN#86 | R5-199421 | 0155 | 1 | F | Correction to chapter 5 and 6 to be aligned with core spec | 16.2.0 |
| 2019-12 | RAN#86 | R5-199422 | 0156 | 1 | F | Editorial correction to CSI reporting tests | 16.2.0 |
| 2019-12 | RAN#86 | R5-199425 | 0146 | 1 | F | Update to FR2 2Rx PDSCH Type A enhanced type X receiver test case | 16.2.0 |
| 2019-12 | RAN#86 | R5-199516 | 0160 | 1 | F | Update PrachConfigIndex in 5.2.3.2.1\_1 test case | 16.2.0 |
| 2019-12 | RAN#86 | R5-199525 | 0148 | 1 | F | Clarification on PDCP SDU size for SDR SA Demod test case | 16.2.0 |
| 2019-12 | RAN#86 | R5-199526 | 0147 | 1 | F | Clarification on PDCP SDU size for SDR NSA Demod test case | 16.2.0 |
| 2019-12 | RAN#86 | R5-199527 | 0143 | 1 | F | Update to FR2 2Rx PDSCH Type A baseline receiver test case | 16.2.0 |
| 2019-12 | RAN#86 | R5-199531 | 0144 | 1 | F | Annex update for UE positioning procedure for Demod test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-199532 | 0150 | 1 | F | Update to FR2 PDCCH Demod test case | 16.2.0 |
| 2019-12 | RAN#86 | R5-199570 | 0158 | 1 | F | Introduction of FR2 CQI test cases | 16.2.0 |
| 2020-03 | RAN#87 | R5-200271 | 0165 | - | F | Update to Demod TC 5.2.3.2.1\_1 | 16.3.0 |
| 2020-03 | RAN#87 | R5-200322 | 0166 | - | F | CR to 38.521-4 to introduce isolation procedure | 16.3.0 |
| 2020-03 | RAN#87 | R5-200450 | 0168 | - | F | Addition of message exceptions for Type2 QCL information | 16.3.0 |
| 2020-03 | RAN#87 | R5-201245 | 0170 | 1 | F | Core alignment to 4Rx PDCCH Demod Test Cases | 16.3.0 |
| 2020-03 | RAN#87 | R5-200453 | 0171 | - | F | Correction to FR1 2Rx PDSCH demodulation test cases | 16.3.0 |
| 2020-03 | RAN#87 | R5-200454 | 0172 | - | F | Correction to FR1 4Rx PDSCH demodulation test cases | 16.3.0 |
| 2020-03 | RAN#87 | R5-200455 | 0173 | - | F | Correction to measurement uncertainty and test tolerance for CQI test cases | 16.3.0 |
| 2020-03 | RAN#87 | R5-200456 | 0174 | - | F | Correction to PDCCH demod TCs | 16.3.0 |
| 2020-03 | RAN#87 | R5-200660 | 0175 | - | F | Correcting CQI value in test procedure | 16.3.0 |
| 2020-03 | RAN#87 | R5-200672 | 0178 | - | F | Updated to Annex A and B for performance tests | 16.3.0 |
| 2020-03 | RAN#87 | R5-200682 | 0179 | - | F | Correction to Applicability rules for Performance tests | 16.3.0 |
| 2020-03 | RAN#87 | R5-200710 | 0180 | - | F | Update of TC 5.2.2.1.3\_1 2Rx FDD PDSCH mapping Type B | 16.3.0 |
| 2020-03 | RAN#87 | R5-200711 | 0181 | - | F | Update of TC 5.2.3.1.2\_1 4Rx FDD PDSCH mapping Type A and CSI-RS overlapped | 16.3.0 |
| 2020-03 | RAN#87 | R5-200712 | 0182 | - | F | Update of TC 5.2.3.1.3\_1 4Rx FDD PDSCH mapping Type B | 16.3.0 |
| 2020-03 | RAN#87 | R5-200713 | 0183 | - | F | Update of TC 5.2.3.2.2\_1 4Rx TDD PDSCH mapping Type A and CSI-RS overlapped | 16.3.0 |
| 2020-03 | RAN#87 | R5-200714 | 0184 | - | F | Update of TC 5.2.3.2.3\_1 4Rx TDD PDSCH mapping Type B | 16.3.0 |
| 2020-03 | RAN#87 | R5-200718 | 0188 | - | F | Update of Test Tolerance in Annex F | 16.3.0 |
| 2020-03 | RAN#87 | R5-200729 | 0189 | - | F | Core spec alignment for FR1 4Rx FDD PDSCH Type A Demodulation performance | 16.3.0 |
| 2020-03 | RAN#87 | R5-200914 | 0176 | 1 | F | Correction to test case 8.2.2.2.1.1 2 Rx, TDD FR2 periodic CQI reporting under AWGN performance for both SA and NSA | 16.3.0 |
| 2020-03 | RAN#87 | R5-200915 | 0164 | 1 | F | Update of Clause 4 in TS 38.521-4 | 16.3.0 |
| 2020-03 | RAN#87 | R5-200985 | 0169 | 1 | F | Core alignment for FR2 demod test case | 16.3.0 |
| 2020-03 | RAN#87 | R5-201068 | 0187 | 1 | F | Update of TC 6.4.2.1\_1 2Rx FDD RI reporting | 16.3.0 |
| 2020-03 | RAN#87 | R5-201090 | 0177 | 1 | F | Replacing derivation paths to 38.331 | 16.3.0 |
| 2020-03 | RAN#87 | R5-201180 | 0167 | 1 | F | Addition of FR2 Demod sustained data rate test case | 16.3.0 |
| 2020-06 | RAN#88 | R5-201816 | 0190 | - | F | Correction to TC 5.2.3.1.1\_4 4Rx FDD FR1 PDSCH mapping Type A performance | 16.4.0 |
| 2020-06 | RAN#88 | R5-201945 | 0191 | - | F | Updated to Annex A and B for performance tests | 16.4.0 |
| 2020-06 | RAN#88 | R5-202242 | 0195 | - | F | Clarification of propagation condition for Demod test cases during call setup | 16.4.0 |
| 2020-06 | RAN#88 | R5-202297 | 0198 | - | F | Correction to 4Rx FDD FR1 periodic CQI reporting under AWGN conditions for both SA and NSA | 16.4.0 |
| 2020-06 | RAN#88 | R5-202980 | 0201 | 1 | F | Correction to CSI reporting test cases missing MIMO correlation matrixes | 16.4.0 |
| 2020-06 | RAN#88 | R5-202304 | 0205 | - | F | Correction to FR2 PDCCH demodulation tests | 16.4.0 |
| 2020-06 | RAN#88 | R5-202307 | 0208 | - | F | Editorial correction on the table numbers for Minimum Test Time | 16.4.0 |
| 2020-06 | RAN#88 | R5-202308 | 0209 | - | F | Editorial correction to 4x4 MIMO PDSCH demodulation tests | 16.4.0 |
| 2020-06 | RAN#88 | R5-202736 | 0197 | 1 | F | Message exception correction for Demod test cases | 16.4.0 |
| 2020-06 | RAN#88 | R5-202737 | 0202 | 1 | F | Correction to FR1 aperiodic subband CQI reporting under fading conditions | 16.4.0 |
| 2020-06 | RAN#88 | R5-202738 | 0203 | 1 | F | Correction to FR1 Single PMI with 8Tx TypeI - SinglePanel codebook for both SA and NSA | 16.4.0 |
| 2020-06 | RAN#88 | R5-202739 | 0207 | 1 | F | Correction to message exception and test description in RI tests | 16.4.0 |
| 2020-06 | RAN#88 | R5-202740 | 0196 | 1 | F | Update to FR2 PDSCH Demod test case | 16.4.0 |
| 2020-06 | RAN#88 | R5-202741 | 0211 | 1 | F | Introduction of 8.4.2.2.1 2Rx TDD FR2 RI reporting for both SA and NSA | 16.4.0 |
| 2020-06 | RAN#88 | R5-202742 | 0210 | 1 | F | Editorial correction to Annex C.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202743 | 0213 | 1 | F | Update Wireless isolation procedure | 16.4.0 |
| 2020-06 | RAN#88 | R5-202766 | 0212 | 1 | F | Updates of FR2 MU and TT in TS 38.521-4 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202832 | 0214 | 1 | F | Addition of message exceptions for PDSCH test cases | 16.4.0 |
| 2020-06 | RAN#88 | R5-202908 | 0193 | 1 | F | Clarification of disabling Tx diversity for FR2 UE for FR2 Demod testing | 16.4.0 |
| 2020-06 | RAN#88 | R5-202979 | 0199 | 2 | F | Correction to 4Rx TDD FR1 RI reporting | 16.4.0 |
| 2020-06 | RAN#88 | R5-202981 | 0204 | 1 | F | Correction to FR2 CQI reporting tests | 16.4.0 |
| 2020-06 | RAN#88 | R5-202989 | 0192 | 1 | F | Updates to 8.2.2.2.2.1, 2Rx TDD FR2 aperiodic CQI reporting under fading performance for both SA and NSA | 16.4.0 |
| 2020-09 | RAN#89 | R5-203298 | 0215 | - | F | Activate Test Mode in NSA Demod Test Cases | 16.5.0 |
| 2020-09 | RAN#89 | R5-203670 | 0217 | - | F | message contents correction for TC 5.2.3.1.2\_1 | 16.5.0 |
| 2020-09 | RAN#89 | R5-203717 | 0219 | - | F | Correction to TC 5.2.3.1.1\_1 4Rx FDD FR1 PDSCH mapping Type A performance | 16.5.0 |
| 2020-09 | RAN#89 | R5-203756 | 0220 | - | F | Removing unnecessary IE rbg-Size from message exceptions | 16.5.0 |
| 2020-09 | RAN#89 | R5-203902 | 0221 | - | F | Correction to Annex G minimum test time table | 16.5.0 |
| 2020-09 | RAN#89 | R5-204062 | 0226 | - | F | Correction to PDSCH reference channel | 16.5.0 |
| 2020-09 | RAN#89 | R5-204063 | 0227 | - | F | Correction to 2Rx FDD FR1 periodic wideband CQI reporting under fading conditions | 16.5.0 |
| 2020-09 | RAN#89 | R5-204064 | 0228 | - | F | Correction to LTE-NR coexistence performance | 16.5.0 |
| 2020-09 | RAN#89 | R5-204100 | 0232 | - | F | Update to common test parameters and channel mappings | 16.5.0 |
| 2020-09 | RAN#89 | R5-204101 | 0233 | - | F | Update E-UTRA cell configuration for NSA | 16.5.0 |
| 2020-09 | RAN#89 | R5-204261 | 0235 | - | F | Editorial correction of message exceptions | 16.5.0 |
| 2020-09 | RAN#89 | R5-204774 | 0223 | 1 | F | Test applicability update for all PDSCH mapping type B test cases | 16.5.0 |
| 2020-09 | RAN#89 | R5-204870 | 0222 | 1 | F | Addition of FR1 2Rx TDD PDSCH mapping type B test case | 16.5.0 |
| 2020-09 | RAN#89 | R5-204871 | 0224 | 1 | F | Addition of 4Rx FDD FR1 RI reporting test case | 16.5.0 |
| 2020-09 | RAN#89 | R5-204933 | 0229 | 1 | F | CR to update MU and TT in 38.521-4 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204934 | 0225 | 1 | F | Correction to frequencyDomainAllocation | 16.5.0 |
| 2020-09 | RAN#89 | R5-204935 | 0230 | 1 | F | Correction to MU and TT for FR1 PMI and RI tests | 16.5.0 |
| 2020-09 | RAN#89 | R5-204936 | 0218 | 1 | F | Update to FR2 PDSCH test case | 16.5.0 |
| 2020-09 | RAN#89 | R5-204937 | 0216 | 1 | F | Annex F Update of MU and TT for FR2 PDSCH and PDCCH Demodulation scenario | 16.5.0 |
| 2020-09 | RAN#89 | R5-204938 | 0236 | 1 | F | Update of AWGN flatness in TS 38.521-4 | 16.5.0 |
| 2020-12 | RAN#90 | R5-205920 | 0243 | - | F | Introduction of new test case for FR2 CA PDSCH Demodulation | 16.6.0 |
| 2020-12 | RAN#90 | R5-205925 | 0247 | - | F | Update to FDD LTE-NR coexistence test case | 16.6.0 |
| 2020-12 | RAN#90 | R5-206090 | 0248 | - | F | Correction to 5.2.2.1.4\_1 LTE NR coexistence performance | 16.6.0 |
| 2020-12 | RAN#90 | R5-206091 | 0249 | - | F | Correction to 9.4B.1.1 Sustained downlink data rate performance for EN-DC within FR1 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206092 | 0250 | - | F | Core alignment to FR1 and FR2 CSI test cases | 16.6.0 |
| 2020-12 | RAN#90 | R5-206093 | 0251 | - | F | Clean up on FR2 CQI and RI test cases | 16.6.0 |
| 2020-12 | RAN#90 | R5-206094 | 0252 | - | F | Clean up on FR1 RI test cases | 16.6.0 |
| 2020-12 | RAN#90 | R5-206097 | 0255 | - | F | Correction to incorrect parameter settings for subband CQI tests | 16.6.0 |
| 2020-12 | RAN#90 | R5-206098 | 0256 | - | F | Correction to Message contents for Sustained downlink data rate tests | 16.6.0 |
| 2020-12 | RAN#90 | R5-206163 | 0259 | - | F | Correction in message content of 5.2.2.2.1\_1, 5.2.3.2.1\_1 test cases | 16.6.0 |
| 2020-12 | RAN#90 | R5-206165 | 0260 | - | F | Update on TB success rate definition in Sustain data rate test cases | 16.6.0 |
| 2020-12 | RAN#90 | R5-206208 | 0262 | - | F | Editorial update of uplink signals | 16.6.0 |
| 2020-12 | RAN#90 | R5-206666 | 0237 | 1 | F | Update of LTE-NR coexistence performance test case 5.2.2.1.4 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206667 | 0238 | 1 | F | Update of LTE-NR coexistence performance test case 5.2.3.1.4 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206668 | 0253 | 1 | F | Correction to number of CQI and HARQ in CQI TCs under fading | 16.6.0 |
| 2020-12 | RAN#90 | R5-206669 | 0254 | 1 | F | Correction to FR1 periodic wideband CQI reporting under fading conditions | 16.6.0 |
| 2020-12 | RAN#90 | R5-206670 | 0258 | 1 | F | Correction of CSI-IM periodicity and offset in 4RX FDD wideband CQI under fading condition | 16.6.0 |
| 2020-12 | RAN#90 | R5-206671 | 0240 | 1 | F | Update to OCNG definition in DEMOD spec | 16.6.0 |
| 2020-12 | RAN#90 | R5-206775 | 0239 | 1 | F | Addition of test case 5.2.2.2.4\_1 2Rx TDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance - 4x2 MIMO with baseline receiver for both SA and NSA | 16.6.0 |
| 2020-12 | RAN#90 | R5-206776 | 0241 | 1 | F | Applicability rules for section 5 CA Demodulation requirements | 16.6.0 |
| 2020-12 | RAN#90 | R5-206777 | 0242 | 1 | F | Applicability rules for section 7 CA Demodulation requirements | 16.6.0 |
| 2020-12 | RAN#90 | R5-206829 | 0263 | 1 | F | Update of Annex F | 16.6.0 |
| 2020-12 | RAN#90 | R5-206830 | 0244 | 1 | F | Update to FR2 PDSCH Demodulation test case | 16.6.0 |
| 2020-12 | RAN#90 | R5-206831 | 0245 | 1 | F | Update to FR2 PDCCH Demodulation test case | 16.6.0 |
| 2020-12 | RAN#90 | R5-206832 | 0246 | 1 | F | Update to FR2 CQI reporting under AWGN test case | 16.6.0 |
| 2020-12 | RAN#90 | R5-206833 | 0261 | 1 | F | CR on MU and testability limit for FR2 demod test case | 16.6.0 |
| 2021-03 | RAN#91 | R5-210520 | 0275 | - | F | Correction to SR config for TDD PDSCH Type A performance test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210521 | 0276 | - | F | Correction to test applicability for LTE-NR coexistence performance test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210522 | 0277 | - | F | Correction to wideband CQI reporting under fading test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210523 | 0278 | - | F | Addition of 8.3.2.2.1 2Rx TDD FR2 Single PMI with 2TX TypeI-SinglePanel Codebook | 16.7.0 |
| 2021-03 | RAN#91 | R5-210770 | 0282 | - | F | Update message content in test case 7.3.2.2.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210773 | 0283 | - | F | Correction in 6.4.2.1\_1 test requirements | 16.7.0 |
| 2021-03 | RAN#91 | R5-210868 | 0284 | - | F | Correction to Table F.1.1.2-2 for FR1 test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210869 | 0285 | - | F | Correction to Test Purpose of PDCCH test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210993 | 0288 | - | F | Editorial, cleanup of some references in 38.521-4 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211050 | 0289 | - | F | Updating applicability in test case 5.2.2.2.4\_1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211081 | 0293 | - | F | Update to downlink physical channel EPRE level for LTE-NR coex scenario | 16.7.0 |
| 2021-03 | RAN#91 | R5-211086 | 0296 | - | F | Adding new CSI test cases to annex F | 16.7.0 |
| 2021-03 | RAN#91 | R5-211658 | 0297 | 1 | F | Addition of new test case 6.3.2.1.3 2Rx FDD FR1 Multiple PMI with 16Tx Type1 - SinglePanel codebook for both SA and NSA | 16.7.0 |
| 2021-03 | RAN#91 | R5-211659 | 0298 | 1 | F | Addition of new test case 6.3.3.1.3 4Rx FDD FR1 Multiple PMI with 16Tx Type1 - SinglePanel codebook for both SA and NSA | 16.7.0 |
| 2021-03 | RAN#91 | R5-211716 | 0280 | 1 | F | Correction to DCI bit size for PDSCH Type B performance and LTE coexistence tests | 16.7.0 |
| 2021-03 | RAN#91 | R5-211717 | 0281 | 1 | F | Correction to LB setup DRB in CLOSE UE TEST LOOP message | 16.7.0 |
| 2021-03 | RAN#91 | R5-211718 | 0286 | 1 | F | Correction to NR test case 6.2.2.1.2.1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211719 | 0273 | 1 | F | Correction to E-UTRA link setup for NSA testing | 16.7.0 |
| 2021-03 | RAN#91 | R5-211813 | 0290 | 1 | F | Adding new test case 6.3.2.2.3, 2Rx TDD FR1 Single PMI with 16Tx Type1 - SinglePanel codebook for both SA and NSA | 16.7.0 |
| 2021-03 | RAN#91 | R5-211814 | 0292 | 1 | F | Adding new test case 6.3.3.2.3, 4Rx TDD FR1 Single PMI with 16Tx Type1 - SinglePanel codebook for both SA and NSA | 16.7.0 |
| 2021-03 | RAN#91 | R5-211816 | 0274 | 1 | F | Update of minimum conformance requirements for 4Rx FDD FR1 PDSCH in TC 5.2.3.1.1\_1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211817 | 0265 | 1 | F | Addition of Applicability of different requirements for R16 NR HST in 5.1.1.7 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211818 | 0268 | 1 | F | Update of Applicability of requirements for mandatory UE features with capability signalling for R16 NR HST in 5.1.1.4 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211819 | 0269 | 1 | F | Update of Applicability of requirements for optional UE features for R16 NR HST in 5.1.1.3 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211820 | 0264 | 1 | F | Addition of Abbreviations and References for R16 NR HST in 3.3 and References | 16.7.0 |
| 2021-03 | RAN#91 | R5-211821 | 0266 | 1 | F | Addition of HST-DPS Channel Profile in B.3.3 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211822 | 0267 | 1 | F | Addition of HST-SFN Channel Profile in B.3.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211823 | 0270 | 1 | F | Update of Combinations of channel model parameters for R16 NR HST in B.2.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211824 | 0271 | 1 | F | Update of Reference measurement channels for PDSCH performance requirements for R16 NR HST in A.3.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211825 | 0272 | 1 | F | Update of Single Tap Channel Profile for R16 NR HST in B.3.1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211916 | 0291 | 1 | F | Adding new test case 6.3.2.2.4, 2Rx TDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | 16.7.0 |
| 2021-03 | RAN#91 | R5-211929 | 0299 | 1 | F | Update of FR2 demod test cases | 16.7.0 |
| 2021-06 | RAN#92 | R5-212063 | 0301 | - | F | Addition of test applicability rules for UE supporting FR2 DL 256QAM | 16.8.0 |
| 2021-06 | RAN#92 | R5-212064 | 0302 | - | F | Updating on annexes for FR2 DL 256QAM test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-212067 | 0303 | - | F | Addition of new test case 6.3.2.1.4 2Rx FDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | 16.8.0 |
| 2021-06 | RAN#92 | R5-212068 | 0304 | - | F | Addition of new test case 6.3.3.1.4 4Rx FDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | 16.8.0 |
| 2021-06 | RAN#92 | R5-212254 | 0308 | - | F | Update MU and TT for 8.4.2.2.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212632 | 0311 | - | F | Correction of E-UTRA link settings | 16.8.0 |
| 2021-06 | RAN#92 | R5-212635 | 0312 | - | F | Correction of DL RMC for TC 5.2.3.1.4\_1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212743 | 0314 | - | F | Update to Demod test cases title | 16.8.0 |
| 2021-06 | RAN#92 | R5-212933 | 0315 | - | F | Addition of eMIMO demod test case 5.2.2.1.11 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212934 | 0316 | - | F | Addition of eMIMO demod test case 5.2.2.2.11 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212935 | 0317 | - | F | Addition of eMIMO demod test case 5.2.3.1.11 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212936 | 0318 | - | F | Addition of eMIMO demod test case 5.2.3.2.11 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212937 | 0319 | - | F | Adding FRC for eMIMO demod test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-212977 | 0327 | - | F | Updating G.1.2 for performance testing | 16.8.0 |
| 2021-06 | RAN#92 | R5-213306 | 0328 | - | F | Introduction of additional PDSCH RMC for FDD | 16.8.0 |
| 2021-06 | RAN#92 | R5-213308 | 0329 | - | F | Update of message exceptions in FR2 demod test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-213341 | 0330 | - | F | Message content update in 5.2.2.2.1\_1 and 5.2.3.2.1\_1 test 1-9 | 16.8.0 |
| 2021-06 | RAN#92 | R5-213342 | 0331 | - | F | Message content update in SA LTE-NR coexistence test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-213358 | 0334 | - | F | Addition of FR1 PDSCH Demodulation CA with power imbalance test case | 16.8.0 |
| 2021-06 | RAN#92 | R5-213919 | 0313 | 1 | F | Correction of derivation paths to 38.508-1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-213920 | 0332 | 1 | F | TT update to FR2 CQI reporting under fading test case | 16.8.0 |
| 2021-06 | RAN#92 | R5-214012 | 0326 | 1 | F | Adding 256QAM into CQI reporting test case | 16.8.0 |
| 2021-06 | RAN#92 | R5-214016 | 0325 | 1 | F | Adding FRC for URLLC demod test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-214058 | 0300 | 1 | F | Update of FR2 demod test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-214059 | 0310 | 1 | F | Correction to TC 9.4B.1.1-SDR performance | 16.8.0 |
| 2021-06 | RAN#92 | R5-214088 | 0307 | 1 | F | Update to minimum test time | 16.8.0 |
| 2021-06 | RAN#92 | R5-214098 | 0333 | 1 | F | Addition of FR1 normal PDSCH demodulation CA test case for 2CC | 16.8.0 |
| 2021-06 | RAN#92 | R5-214099 | 0320 | 1 | F | Addition of URLLC demod test case 5.2.2.1.5 | 16.8.0 |
| 2021-06 | RAN#92 | R5-214100 | 0321 | 1 | F | Addition of URLLC demod test case 5.2.2.2.5 | 16.8.0 |
| 2021-06 | RAN#92 | R5-214101 | 0322 | 1 | F | Addition of URLLC demod test case 5.2.3.1.5 | 16.8.0 |
| 2021-06 | RAN#92 | R5-214102 | 0323 | 1 | F | Addition of URLLC demod test case 5.2.3.2.5 | 16.8.0 |
| 2021-06 | RAN#92 | R5-214103 | 0324 | 1 | F | Adding MU and TT for URLLC demod test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-214112 | 0306 | 1 | F | Core alignment of common test parameters for PDCCH demodulation tests | 16.8.0 |
| 2021-09 | RAN#93 | R5-214533 | 0338 | - | F | Updates on FRC for FR2 DL 256QAM | 16.9.0 |
| 2021-09 | RAN#93 | R5-215065 | 0353 | - | F | Core spec alignment of RMC | 16.9.0 |
| 2021-09 | RAN#93 | R5-215084 | 0357 | - | F | Addition of eMIMO demod test case 5.2.2.2.12 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215085 | 0358 | - | F | Addition of eMIMO demod test case 5.2.2.2.13 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215090 | 0363 | - | F | Addition of eMIMO demod test case 5.2.3.2.12 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215091 | 0364 | - | F | Addition of eMIMO demod test case 5.2.3.2.13 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215092 | 0365 | - | F | Addition of eMIMO demod test case 5.2.3.2.14 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215093 | 0366 | - | F | Adding FRC for eMIMO demod test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-215094 | 0367 | - | F | Adding MU and TT for eMIMO demod test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-215103 | 0372 | - | F | Addition of URLLC demod test case 5.2.3.2.7 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215342 | 0380 | - | F | Correction to reporting granularity for single PMI TCs | 16.9.0 |
| 2021-09 | RAN#93 | R5-215343 | 0381 | - | F | Correction to test time for measuring CQI in Sub-band CQI TCs | 16.9.0 |
| 2021-09 | RAN#93 | R5-215345 | 0383 | - | F | Correction to DCI bitlength for test 1-5 and 1-6 in TC 5.2.2.2.1\_1 and 5.2.3.2.1\_1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215470 | 0387 | - | F | Correction of message exceptions in PDCCH test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-215609 | 0390 | - | F | MTSU and TT mapping related to Max Device Size in TS 38.521-4 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215610 | 0391 | - | F | Update 9.4B.1.1 message content | 16.9.0 |
| 2021-09 | RAN#93 | R5-215663 | 0394 | - | F | Updates to FR1 2DLCA PDSCH demodulation with power imbalance test case | 16.9.0 |
| 2021-09 | RAN#93 | R5-215665 | 0396 | - | F | Editorial correction to the section 6.2.2.2.2 title | 16.9.0 |
| 2021-09 | RAN#93 | R5-215666 | 0397 | - | F | Update to test coverage across 5G NR architecture options for Demod scenarios | 16.9.0 |
| 2021-09 | RAN#93 | R5-215901 | 0346 | 1 | F | Update FR2 RI test configuration update for TS 38.521-4 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215902 | 0382 | 1 | F | Editorial error correction in Section 7 and 8 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215934 | 0360 | 1 | F | Addition of eMIMO demod test case 5.2.3.1.12 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215937 | 0343 | 1 | F | Update of Annex F for test cases of demodulation for power saving | 16.9.0 |
| 2021-09 | RAN#93 | R5-215942 | 0339 | 1 | F | Updates to PDSCH Demodulation Performance for 2DL CA | 16.9.0 |
| 2021-09 | RAN#93 | R5-215944 | 0345 | 1 | F | Update Applicability of requirement for HST-DPS and multi-TRxP test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-215946 | 0350 | 1 | F | Addition of NR HST Demod TC 5.2.2.1.9 - HST SFN | 16.9.0 |
| 2021-09 | RAN#93 | R5-215947 | 0351 | 1 | F | Addition of NR HST Demod TC 5.2.2.1.10 - HST DPS | 16.9.0 |
| 2021-09 | RAN#93 | R5-215950 | 0368 | 1 | F | Completing CQI reporting test case with 256QAM | 16.9.0 |
| 2021-09 | RAN#93 | R5-215952 | 0369 | 1 | F | Addition of URLLC demod test case 5.2.2.1.7 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215953 | 0370 | 1 | F | Addition of URLLC demod test case 5.2.2.2.7 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215954 | 0374 | 1 | F | Addition of 5.2.2.1.6 2Rx FDD FR1 PDSCH repetitions over multiple slots performance | 16.9.0 |
| 2021-09 | RAN#93 | R5-215955 | 0375 | 1 | F | Addition of 5.2.2.1.8 2Rx FDD FR1 PDSCH pre-emption performance | 16.9.0 |
| 2021-09 | RAN#93 | R5-215956 | 0376 | 1 | F | Addition of 5.2.2.2.6 2Rx TDD FR1 PDSCH repetitions over multiple slots performance | 16.9.0 |
| 2021-09 | RAN#93 | R5-215957 | 0377 | 1 | F | Addition of 5.2.2.2.8 2Rx TDD FR1 PDSCH pre-emption performance | 16.9.0 |
| 2021-09 | RAN#93 | R5-215958 | 0378 | 1 | F | Addition of 5.2.3.1.6 4Rx FDD FR1 PDSCH repetitions over multiple slots performance | 16.9.0 |
| 2021-09 | RAN#93 | R5-215959 | 0379 | 1 | F | Addition of 5.2.3.2.6 4Rx TDD FR1 PDSCH repetitions over multiple slots performance | 16.9.0 |
| 2021-09 | RAN#93 | R5-216021 | 0385 | 1 | F | Clean-up of parameter settings and message contents in 8.4.2.2.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216040 | 0384 | 1 | F | Correction to dedicated CORESET ID setting in PDCCH-Config for Standalone | 16.9.0 |
| 2021-09 | RAN#93 | R5-216041 | 0388 | 1 | F | Update of message exceptions | 16.9.0 |
| 2021-09 | RAN#93 | R5-216071 | 0359 | 1 | F | Addition of eMIMO demod test case 5.2.2.2.14 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216072 | 0340 | 1 | F | Addition of 2Rx TDD FR1 PDCCH 1 Tx antenna performance for power saving test case | 16.9.0 |
| 2021-09 | RAN#93 | R5-216073 | 0341 | 1 | F | Addition of 4Rx TDD FR1 PDCCH 1 Tx antenna performance for power saving test case | 16.9.0 |
| 2021-09 | RAN#93 | R5-216074 | 0342 | 1 | F | Addition of 2Rx TDD FR2 PDCCH 1 Tx antenna performance for power saving test case | 16.9.0 |
| 2021-09 | RAN#93 | R5-216075 | 0395 | 1 | F | Updates to FR2 2DLCA PDSCH demodulation test case | 16.9.0 |
| 2021-09 | RAN#93 | R5-216076 | 0337 | 1 | F | Addition of FR2 DL 256QAM demodulation test case | 16.9.0 |
| 2021-09 | RAN#93 | R5-216078 | 0371 | 1 | F | Addition of URLLC demod test case 5.2.3.1.7 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216096 | 0336 | 1 | F | Update of FR2 demod test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-216112 | 0347 | 1 | F | Addition of NR PS Demod TC 5.3.2.1.3-FR1 FDD 2Rx | 16.9.0 |
| 2021-09 | RAN#93 | R5-216113 | 0348 | 1 | F | Addition of NR PS Demod TC 5.3.3.1.3-FR1 FDD 4Rx | 16.9.0 |
| 2021-09 | RAN#93 | R5-216118 | 0392 | 1 | F | Update to FR2 NSA SDR TC 9.4B.1.2 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216126 | 0354 | 1 | F | Addition of eMIMO demod test case 5.2.2.1.12 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216127 | 0355 | 1 | F | Addition of eMIMO demod test case 5.2.2.1.13 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216128 | 0356 | 1 | F | Addition of eMIMO demod test case 5.2.2.1.14 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216129 | 0361 | 1 | F | Addition of eMIMO demod test case 5.2.3.1.13 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216130 | 0362 | 1 | F | Addition of eMIMO demod test case 5.2.3.1.14 | 16.9.0 |
| 2021-12 | RAN#94 | R5-216786 | 0403 | - | F | Addition of applicability of different requirements with Multi-TRxP | 16.10.0 |
| 2021-12 | RAN#94 | R5-216787 | 0404 | - | F | Update Applicability of requirements for optional UE features | 16.10.0 |
| 2021-12 | RAN#94 | R5-216908 | 0407 | - | F | Addition of NR HST Demod TC 5.2.2.1.1\_1 - 2Rx FDD type A | 16.10.0 |
| 2021-12 | RAN#94 | R5-216909 | 0408 | - | F | Addition of NR HST Demod TC 5.2.2.2.1\_1 - 2Rx TDD type A | 16.10.0 |
| 2021-12 | RAN#94 | R5-216910 | 0409 | - | F | Correction to NR HST Demod TC 5.2.2.1.9\_1 - HST-SFN | 16.10.0 |
| 2021-12 | RAN#94 | R5-217059 | 0412 | - | F | Correction to NR TC 5.3.2.1.1-2Rx FDD FR1 PDCCH 1 Tx antenna performance | 16.10.0 |
| 2021-12 | RAN#94 | R5-217060 | 0413 | - | F | Correction to NR TC 5.3.3.2.1-PDCCH 1 Tx antenna performance | 16.10.0 |
| 2021-12 | RAN#94 | R5-217363 | 0430 | - | F | Addition of RMC in Annex A for eMIMO enhanced typeII CSI reporting | 16.10.0 |
| 2021-12 | RAN#94 | R5-217364 | 0431 | - | F | Addition of B.2.3.2.3A Beam steering approach with dual cluster beams | 16.10.0 |
| 2021-12 | RAN#94 | R5-217370 | 0434 | - | F | Updating 5.2.x.y.7 PDSCH with UE processing capability 2 | 16.10.0 |
| 2021-12 | RAN#94 | R5-217375 | 0439 | - | F | Update to Annex F for URLLC test cases | 16.10.0 |
| 2021-12 | RAN#94 | R5-217377 | 0441 | - | F | Update to applicability of optional features for URLLC test cases | 16.10.0 |
| 2021-12 | RAN#94 | R5-217378 | 0442 | - | F | Update to URLLC RMC for demodulation testing in Annex A | 16.10.0 |
| 2021-12 | RAN#94 | R5-217437 | 0443 | - | F | Correction to frequencyDomainResources in PDCCHConfigCommon message exception | 16.10.0 |
| 2021-12 | RAN#94 | R5-217522 | 0446 | - | F | Addition of DL and UL RMC for FR2 SDR test case | 16.10.0 |
| 2021-12 | RAN#94 | R5-217525 | 0449 | - | F | Updates to FR1 normal PDSCH CA test cases | 16.10.0 |
| 2021-12 | RAN#94 | R5-217526 | 0450 | - | F | Updates to FR2 normal PDSCH CA test cases | 16.10.0 |
| 2021-12 | RAN#94 | R5-218248 | 0424 | 1 | F | Updating minimum test time in Annex G | 16.10.0 |
| 2021-12 | RAN#94 | R5-218308 | 0425 | 1 | F | Addition of 6.3.2.1.6 2Rx FDD FR1 Multiple PMI with 16Tx Enhanced Type II codebook | 16.10.0 |
| 2021-12 | RAN#94 | R5-218309 | 0426 | 1 | F | Addition of 6.3.2.2.6 2Rx TDD FR1 Multiple PMI with 16Tx Enhanced Type II codebook | 16.10.0 |
| 2021-12 | RAN#94 | R5-218310 | 0427 | 1 | F | Addition of 6.3.3.1.6 4Rx FDD FR1 Multiple PMI with 16Tx Enhanced Type II codebook | 16.10.0 |
| 2021-12 | RAN#94 | R5-218311 | 0428 | 1 | F | Addition of 6.3.3.2.6 4Rx TDD FR1 Multiple PMI with 16Tx Enhanced Type II codebook | 16.10.0 |
| 2021-12 | RAN#94 | R5-218312 | 0429 | 1 | F | Addition of applicability of optional features in 6.1.1.3 | 16.10.0 |
| 2021-12 | RAN#94 | R5-218328 | 0405 | 1 | F | Correction to PS Demod TC 5.3.2.1.3 - 2Rx | 16.10.0 |
| 2021-12 | RAN#94 | R5-218329 | 0406 | 1 | F | Correction to PS Demod TC 5.3.3.1.3 - 4Rx | 16.10.0 |
| 2021-12 | RAN#94 | R5-218339 | 0420 | 1 | F | Addition of new test case 6.3.2.1.5 2Rx FDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | 16.10.0 |
| 2021-12 | RAN#94 | R5-218340 | 0421 | 1 | F | Addition of new test case 6.3.2.2.5 2Rx TDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | 16.10.0 |
| 2021-12 | RAN#94 | R5-218341 | 0422 | 1 | F | Addition of new test case 6.3.3.1.5 4Rx FDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | 16.10.0 |
| 2021-12 | RAN#94 | R5-218342 | 0423 | 1 | F | Addition of new test case 6.3.3.2.5 4Rx TDD FR1 Multiple PMI with 16Tx TypeII codebook for both SA and NSA | 16.10.0 |
| 2021-12 | RAN#94 | R5-218343 | 0444 | 1 | F | Correction to TC 5.2.2.2.4\_1 and editorial corrections | 16.10.0 |
| 2021-12 | RAN#94 | R5-218344 | 0447 | 1 | F | Addition of NE-DC SDR test case | 16.10.0 |
| 2021-12 | RAN#94 | R5-218345 | 0399 | 1 | F | Addition of new test case 5.2.3.1.9\_1 for NR HST | 16.10.0 |
| 2021-12 | RAN#94 | R5-218346 | 0400 | 1 | F | Addition of new test case 5.2.3.1.10\_1 for NR HST | 16.10.0 |
| 2021-12 | RAN#94 | R5-218347 | 0414 | 1 | F | Addition of test case 5.2.2.2.9\_1, 2Rx TDD FR1 HST-SFN performance - 2x2 MIMO with baseline receiver for both SA and NSA | 16.10.0 |
| 2021-12 | RAN#94 | R5-218348 | 0415 | 1 | F | Addition of test case 5.2.2.2.10\_1, 2Rx TDD FR1 HST-DPS performance - 2x2 MIMO with baseline receiver for both SA and NSA | 16.10.0 |
| 2021-12 | RAN#94 | R5-218349 | 0416 | 1 | F | Addition of test case 5.2.3.2.9\_1, 4Rx TDD FR1 HST-SFN performance - 2x4 MIMO with baseline receiver for both SA and NSA | 16.10.0 |
| 2021-12 | RAN#94 | R5-218350 | 0418 | 1 | F | Addition of test cases 5.2.2.2.9\_1, 5.2.2.2.10\_1, 5.2.3.2.9\_1 to annex F | 16.10.0 |
| 2021-12 | RAN#94 | R5-218357 | 0419 | 1 | F | Update of URLLC demodulation Test Cases | 16.10.0 |
| 2021-12 | RAN#94 | R5-218358 | 0433 | 1 | F | Updating 5.2.x.y.5 PDSCH with 1e-5 BLER | 16.10.0 |
| 2021-12 | RAN#94 | R5-218359 | 0435 | 1 | F | Addition of 6.2.2.1.1.2 URLLC 2RX FDD CQI reporting test case | 16.10.0 |
| 2021-12 | RAN#94 | R5-218360 | 0440 | 1 | F | Addition of statistical testing limit for URLLC test cases in Annex G | 16.10.0 |
| 2021-12 | RAN#94 | R5-218436 | 0453 | 1 | F | Update to LTE-NR coex test case message exception | 16.10.0 |
| 2021-12 | RAN#94 | R5-218462 | 0432 | 1 | F | Addition of MU and TT in Annex F for enhanced typeII CSI reporting | 16.10.0 |
| 2021-12 | RAN#94 | R5-218465 | 0401 | 1 | F | Addition of PDCCH Search Space Ext configuration for power saving test case | 16.10.0 |
| 2021-12 | RAN#94 | R5-218466 | 0417 | 1 | F | Update of test case 5.2.3.2.1\_1, 4Rx TDD FR1 PDSCH mapping Type A performance - 2x4 MIMO with baseline receiver for both SA and NSA | 16.10.0 |
| 2021-12 | RAN#94 | R5-218467 | 0436 | 1 | F | Addition of 6.2.2.2.1.2 URLLC 2RX TDD CQI reporting test case | 16.10.0 |
| 2021-12 | RAN#94 | R5-218468 | 0437 | 1 | F | Addition of 6.2.3.1.1.2 URLLC 4RX FDD CQI reporting test case | 16.10.0 |
| 2021-12 | RAN#94 | R5-218469 | 0438 | 1 | F | Addition of 6.2.3.2.1.2 URLLC 4RX TDD CQI reporting test case | 16.10.0 |
| 2021-12 | RAN#94 | R5-218486 | 0445 | 1 | F | Clarification on cl 4.6 test coverage across 5G NR architecture options for Demod | 16.10.0 |
| 2022-03 | RAN#95 | R5-220276 | 0454 | - | F | Clarifications on 5G NR connectivity options for Demod | 16.11.0 |
| 2022-03 | RAN#95 | R5-220629 | 0460 | - | F | Correction to demod TC 5.2.2.1.4\_1 | 16.11.0 |
| 2022-03 | RAN#95 | R5-220630 | 0461 | - | F | Correction to demod TC 5.2.3.2.1\_1 | 16.11.0 |
| 2022-03 | RAN#95 | R5-220634 | 0463 | - | F | Updates to HST test case 5.2.3.1.9\_1 | 16.11.0 |
| 2022-03 | RAN#95 | R5-220635 | 0464 | - | F | Updates to HST test case 5.2.3.1.10\_1 | 16.11.0 |
| 2022-03 | RAN#95 | R5-220638 | 0467 | - | F | Addition of fading profile power uncertainty for 4Tx, FR1 | 16.11.0 |
| 2022-03 | RAN#95 | R5-220651 | 0468 | - | F | Editorial correction for test case title in Annex F | 16.11.0 |
| 2022-03 | RAN#95 | R5-220664 | 0469 | - | F | Editorial change for the position of clause 5.2.3.1.9 and 5.2.3.1.10 | 16.11.0 |
| 2022-03 | RAN#95 | R5-220678 | 0471 | - | F | Correcting applicability part of HST test cases in 38.521-4 | 16.11.0 |
| 2022-03 | RAN#95 | R5-220684 | 0473 | - | F | Addition of new RMCs to Annex | 16.11.0 |
| 2022-03 | RAN#95 | R5-220686 | 0475 | - | F | Correcting test applicability for EN-DC, rel-16 to rel-15 | 16.11.0 |
| 2022-03 | RAN#95 | R5-220751 | 0476 | - | F | Correction to PS Demod TC 5.3.2.1.3 | 16.11.0 |
| 2022-03 | RAN#95 | R5-220764 | 0477 | - | F | Updating test case 6.3.2.2.3, 2Rx TDD FR1 Single PMI with 16Tx Type1 - SinglePanel codebook for both SA and NSA | 16.11.0 |
| 2022-03 | RAN#95 | R5-220796 | 0478 | - | F | Update to eMIMO demod test cases | 16.11.0 |
| 2022-03 | RAN#95 | R5-220820 | 0487 | - | F | Adding testability description of 7.2.2.2.2 and 7.2.2.2.3 | 16.11.0 |
| 2022-03 | RAN#95 | R5-220936 | 0493 | - | F | Editorial correction to 5.3.3.1.3 and 5.3.3.2.3 | 16.11.0 |
| 2022-03 | RAN#95 | R5-221153 | 0494 | - | F | Update to FR1 CA normal PDSCH test cases | 16.11.0 |
| 2022-03 | RAN#95 | R5-221154 | 0495 | - | F | Update to FR1 CA power imbalance test cases | 16.11.0 |
| 2022-03 | RAN#95 | R5-221155 | 0496 | - | F | Update to FR2 CA normal PDSCH test cases | 16.11.0 |
| 2022-03 | RAN#95 | R5-221707 | 0499 | 1 | F | Editorial update to PBCH demod requirements section | 16.11.0 |
| 2022-03 | RAN#95 | R5-221708 | 0500 | 1 | F | Update to testability of test requirements due to achievable SNR improvements | 16.11.0 |
| 2022-03 | RAN#95 | R5-221709 | 0501 | 1 | F | FR1 NSA SDR message contents update | 16.11.0 |
| 2022-03 | RAN#95 | R5-221710 | 0491 | 1 | F | Correction to Annex H.1.2 | 16.11.0 |
| 2022-03 | RAN#95 | R5-221842 | 0455 | 1 | F | Correction on Type I PMI test cases | 16.11.0 |
| 2022-03 | RAN#95 | R5-221843 | 0456 | 1 | F | Addition of FR1 CA CQI test cases | 16.11.0 |
| 2022-03 | RAN#95 | R5-221844 | 0457 | 1 | F | Addition of applicability for FR1 CA CQI test requirements | 16.11.0 |
| 2022-03 | RAN#95 | R5-221845 | 0474 | 1 | F | Addition of test case 5.2.3.2.4\_1, 4Rx TDD FR1 PDSCH Mapping Type A and LTE-NR coexistence performance - 4x4 MIMO with baseline receiver for both SA and NSA | 16.11.0 |
| 2022-03 | RAN#95 | R5-221846 | 0497 | 1 | F | Introduction of FR1 CA SDR test case | 16.11.0 |
| 2022-03 | RAN#95 | R5-221847 | 0458 | 1 | F | Addition of FR2 CA CQI test cases | 16.11.0 |
| 2022-03 | RAN#95 | R5-221848 | 0459 | 1 | F | Addition of applicability for FR2 CA CQI test requirements | 16.11.0 |
| 2022-03 | RAN#95 | R5-221854 | 0470 | 1 | F | Addition of test case 5.2.3.2.10\_1, 4Rx TDD FR1 HST DPS performance - 2x4 MIMO with baseline receiver for both SA and NSA | 16.11.0 |
| 2022-03 | RAN#95 | R5-221855 | 0502 | 1 | F | Update to HST Demod test cases | 16.11.0 |
| 2022-03 | RAN#95 | R5-221856 | 0465 | 1 | F | Addition of HST test case 5.2.3.1.9\_1 to annex F | 16.11.0 |
| 2022-03 | RAN#95 | R5-221857 | 0466 | 1 | F | Addition of HST test case 5.2.3.1.10\_1 to annex F | 16.11.0 |
| 2022-03 | RAN#95 | R5-221860 | 0480 | 1 | F | Update to 5.2.x.y.5 PDSCH with 1e-5 BLER | 16.11.0 |
| 2022-03 | RAN#95 | R5-221861 | 0481 | 1 | F | Update to 5.2.x.y.6 PDSCH with repetitions over multiple slots | 16.11.0 |
| 2022-03 | RAN#95 | R5-221862 | 0483 | 1 | F | Update to 5.2.2.y.8 PDSCH pre-emption | 16.11.0 |
| 2022-03 | RAN#95 | R5-221863 | 0484 | 1 | F | Addition of 5.2.3.1.8 PDSCH pre-emption 4Rx FDD | 16.11.0 |
| 2022-03 | RAN#95 | R5-221864 | 0485 | 1 | F | Addition of 5.2.3.2.8 PDSCH pre-emption 4Rx TDD | 16.11.0 |
| 2022-03 | RAN#95 | R5-221865 | 0488 | 1 | F | Addition of 7.2.2.2.2 FR2 PDSCH repetition | 16.11.0 |
| 2022-03 | RAN#95 | R5-221866 | 0489 | 1 | F | Addition of 7.2.2.2.3 FR2 PDSCH mapping Type B | 16.11.0 |
| 2022-03 | RAN#95 | R5-221867 | 0479 | 1 | F | Addition of minimum test time for 1% residual BLER | 16.11.0 |
| 2022-03 | RAN#95 | R5-221868 | 0486 | 1 | F | Update to Annex F for URLLC test cases | 16.11.0 |
| 2022-06 | RAN#96 | R5-222231 | 0503 | - | F | Update of Demod TC 5.2.2.1.9\_1 2Rx FDD FR1 HST-SFN performance | 16.12.0 |
| 2022-06 | RAN#96 | R5-222232 | 0504 | - | F | Update of Demod TC 5.2.3.1.1\_1 4Rx FDD FR1 PDSCH mapping Type A perf for NR HST | 16.12.0 |
| 2022-06 | RAN#96 | R5-222233 | 0505 | - | F | Update of Demod TC 5.2.3.1.9\_1 4Rx FDD FR1 HST-SFN performance | 16.12.0 |
| 2022-06 | RAN#96 | R5-222234 | 0506 | - | F | Update of Demod TC 5.2.3.1.10\_1 4Rx FDD FR1 HST-DPS performance | 16.12.0 |
| 2022-06 | RAN#96 | R5-222498 | 0509 | - | F | Correction to k0 value description | 16.12.0 |
| 2022-06 | RAN#96 | R5-222499 | 0510 | - | F | Correction to coreset RB in 5.3.2.1.3 and 5.3.3.1.3 | 16.12.0 |
| 2022-06 | RAN#96 | R5-222585 | 0519 | - | F | Update to FR1 CA SDR test case | 16.12.0 |
| 2022-06 | RAN#96 | R5-222595 | 0524 | - | F | Correction to demod test case procedure | 16.12.0 |
| 2022-06 | RAN#96 | R5-222619 | 0525 | - | F | Addition of NR SL Demod TC 11.1.2 - PSSCH | 16.12.0 |
| 2022-06 | RAN#96 | R5-222620 | 0526 | - | F | Addition of NR SL Demod TC 11.1.3 - PSCCH | 16.12.0 |
| 2022-06 | RAN#96 | R5-222621 | 0527 | - | F | Addition of NR SL Demod TC 11.1.4 - PSBCH | 16.12.0 |
| 2022-06 | RAN#96 | R5-222622 | 0528 | - | F | Addition of NR SL Demod TC 11.1.5 - PSFCH | 16.12.0 |
| 2022-06 | RAN#96 | R5-222623 | 0529 | - | F | Addition of NR SL Demod TC 11.1.6 - imbalance | 16.12.0 |
| 2022-06 | RAN#96 | R5-222624 | 0530 | - | F | Addition of NR SL Demod TC 11.1.7 - soft buffer | 16.12.0 |
| 2022-06 | RAN#96 | R5-222625 | 0531 | - | F | Addition of NR SL Demod TC 11.1.8 - PSCCH capability | 16.12.0 |
| 2022-06 | RAN#96 | R5-222627 | 0533 | - | F | Correction to references for NR SL Demod | 16.12.0 |
| 2022-06 | RAN#96 | R5-222628 | 0534 | - | F | Addition of NR SL Demod RMCs in Annex A | 16.12.0 |
| 2022-06 | RAN#96 | R5-222629 | 0535 | - | F | Addition of test tolerance for NR SL Demod in Annex F | 16.12.0 |
| 2022-06 | RAN#96 | R5-222630 | 0536 | - | F | Addition of test method for NR SL Demod in Annex G | 16.12.0 |
| 2022-06 | RAN#96 | R5-222895 | 0540 | - | F | Update to URLLC test cases 5.2.x.y.7 | 16.12.0 |
| 2022-06 | RAN#96 | R5-222898 | 0543 | - | F | Update to URLLC test case 7.2.2.2.3 | 16.12.0 |
| 2022-06 | RAN#96 | R5-223024 | 0547 | - | F | Update of FR1 RI reporting test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223048 | 0548 | - | F | Removal of duplicate clauses from the Demod spec | 16.12.0 |
| 2022-06 | RAN#96 | R5-223049 | 0549 | - | F | Addition of test case 6.3.3.2.4, 4Rx TDD FR1 Single PMI with 32Tx Type1 - SinglePanel codebook for both SA and NSA | 16.12.0 |
| 2022-06 | RAN#96 | R5-223107 | 0551 | - | F | Correction in performance enhancement test cases 6.3.2.2.3, 6.3.2.2.4 and 6.3.3.2.3 | 16.12.0 |
| 2022-06 | RAN#96 | R5-223119 | 0552 | - | F | Solving editor notes for Type I PMI test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223120 | 0553 | - | F | Solving editor notes for Type II PMI test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223153 | 0554 | - | F | Solve duplicated information in Annex | 16.12.0 |
| 2022-06 | RAN#96 | R5-223275 | 0555 | - | F | Update of FR2 CQI CA test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223704 | 0532 | 1 | F | Addition of NR SL Demod TC 11.1.9 - PSFCH capability | 16.12.0 |
| 2022-06 | RAN#96 | R5-223714 | 0508 | 1 | F | Correction to PDCCH parameters in 5.2.2.1.4 and 5.2.2.2.4 | 16.12.0 |
| 2022-06 | RAN#96 | R5-223715 | 0516 | 1 | F | Update to FR1 CA normal PDSCH test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223716 | 0517 | 1 | F | Update to FR1 CA power imbalance test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223717 | 0520 | 1 | F | Update to FR1 CA CQI reporting test case | 16.12.0 |
| 2022-06 | RAN#96 | R5-223718 | 0518 | 1 | F | Update to FR2 CA normal PDSCH test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223719 | 0521 | 1 | F | Introduction of FR2 CA SDR test case | 16.12.0 |
| 2022-06 | RAN#96 | R5-223722 | 0544 | 1 | F | Editorial, removal of editors note in test case 5.2.2.2.10\_1 | 16.12.0 |
| 2022-06 | RAN#96 | R5-223723 | 0545 | 1 | F | Adding TT and removal of editors note in test case 5.2.3.2.9\_1 | 16.12.0 |
| 2022-06 | RAN#96 | R5-223724 | 0546 | 1 | F | Adding TT and removal of editors note in test case 5.2.3.2.10\_1 | 16.12.0 |
| 2022-06 | RAN#96 | R5-223726 | 0539 | 1 | F | Update to URLLC test cases 5.2.x.y.6 | 16.12.0 |
| 2022-06 | RAN#96 | R5-223727 | 0537 | 1 | F | Update to Annex G for minimum test time | 16.12.0 |
| 2022-06 | RAN#96 | R5-223728 | 0538 | 1 | F | Update to Annex F for URLLC test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223837 | 0512 | 1 | F | Correction to the reference of test frequency | 16.12.0 |
| 2022-06 | RAN#96 | R5-223838 | 0513 | 1 | F | Clarification of UL RMC in FR1 PMI test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223839 | 0515 | 1 | F | Update of LTE-NR coexistence test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223840 | 0514 | 1 | F | Update of FR2 test cases | 16.12.0 |
| 2022-06 | RAN#96 | R5-223841 | 0522 | 1 | F | Introduction of FR2 SDR test case | 16.12.0 |
| 2022-06 | RAN#96 | R5-223871 | 0511 | 1 | F | Correction to CSI-Report periodicity and offset in 6.2A.3.1 | 16.12.0 |
| 2022-09 | RAN#97 | R5-224502 | 0556 | - | F | Re-organization of NR SL Demod test cases | 16.13.0 |
| 2022-09 | RAN#97 | R5-224503 | 0557 | - | F | Correction to Annex F for NR SL Demod TCs | 16.13.0 |
| 2022-09 | RAN#97 | R5-224633 | 0559 | - | F | Core alignment and editorial corrections for FR1 Demodulation CA test cases | 16.13.0 |
| 2022-09 | RAN#97 | R5-224642 | 0560 | - | F | Correction to CQI-RI-PMI delay in 6.2A.3.1 | 16.13.0 |
| 2022-09 | RAN#97 | R5-224643 | 0561 | - | F | Correction to DCI bit size in 5.2.2.2.4\_1 | 16.13.0 |
| 2022-09 | RAN#97 | R5-224644 | 0562 | - | F | Correction to message exception in 5.2.3.2.10\_1 | 16.13.0 |
| 2022-09 | RAN#97 | R5-224655 | 0563 | - | F | Addition of missing message exceptions for CQI tests | 16.13.0 |
| 2022-09 | RAN#97 | R5-224657 | 0565 | - | F | Update of FR2 PDCCH TCs | 16.13.0 |
| 2022-09 | RAN#97 | R5-225004 | 0569 | - | F | Editorial correction to sub-clause ID for test requirement to TC5.2.3.2.1\_x | 16.13.0 |
| 2022-09 | RAN#97 | R5-225110 | 0573 | - | F | Correction of aperiodicTriggeringOffset | 16.13.0 |
| 2022-09 | RAN#97 | R5-225118 | 0575 | - | F | Correction of CQI reporting test cases | 16.13.0 |
| 2022-09 | RAN#97 | R5-225121 | 0577 | - | F | Update of minimum test time | 16.13.0 |
| 2022-09 | RAN#97 | R5-225208 | 0578 | - | F | Update CQI report periodicity for TDD FR1 periodic wideband CQI reporting under fading conditions | 16.13.0 |
| 2022-09 | RAN#97 | R5-225670 | 0566 | 1 | F | FR2 demod testability update | 16.13.0 |
| 2022-09 | RAN#97 | R5-225726 | 0579 | 1 | F | Corrections for FDD Power Saving test cases | 16.13.0 |
| 2022-09 | RAN#97 | R5-225727 | 0580 | 1 | F | Corrections for TDD Power Saving test cases | 16.13.0 |
| 2022-09 | RAN#97 | R5-225809 | 0558 | 1 | F | Core alignment and editorial corrections for FR1 CSI CA test cases | 16.13.0 |
| 2022-09 | RAN#97 | R5-225810 | 0572 | 1 | F | Removal of brackets for DCI format in clause 5 | 16.13.0 |
| 2022-09 | RAN#97 | R5-225811 | 0574 | 1 | F | Correction of NR-LTE coexistence test cases | 16.13.0 |
| 2022-09 | RAN#97 | R5-225812 | 0576 | 1 | F | Clarification of UL RMC in FR1 aperiodic CQI reporting tests | 16.13.0 |
| 2022-09 | RAN#97 | R5-225813 | 0564 | 1 | F | Addition of missing RMC for PDCCH tests | 16.13.0 |
| 2022-09 | RAN#97 | R5-225024 | 0570 | - | F | Addition of test case 5.2A.2.4.1, 2Rx Normal Demodulation Performance for HST-SFN CA | 17.0.0 |
| 2022-09 | RAN#97 | R5-225769 | 0571 | 1 | F | Addition of test case 5.2A.2.5.1, 2RX PDSCH Demodulation Performance for HST-DPS CA | 17.0.0 |
| 2022-09 | RAN#97 | R5-225770 | 0567 | 1 | F | Minimum test time for new HST enhancement RMCs | 17.0.0 |
| 2022-12 | RAN#98 | R5-226356 | 0585 |  | F | Addition of TT for NR R17 HST enh Demod in Annex F | 17.1.0 |
| 2022-12 | RAN#98 | R5-226528 | 0588 |  | F | Update of PDSCH RMC for PDCCH TCs | 17.1.0 |
| 2022-12 | RAN#98 | R5-226662 | 0593 |  | F | RAN4 alignment of PUCCH format for CA test cases | 17.1.0 |
| 2022-12 | RAN#98 | R5-226667 | 0597 |  | F | correction to 5.2A.x TP selection | 17.1.0 |
| 2022-12 | RAN#98 | R5-226682 | 0605 |  | F | Addition of minimum test time for RedCap demod test cases | 17.1.0 |
| 2022-12 | RAN#98 | R5-226687 | 0607 |  | F | Addition of test case 5.2.1.1.1 1Rx FDD FR1 PDSCH performance for RedCap | 17.1.0 |
| 2022-12 | RAN#98 | R5-226688 | 0608 |  | F | Addition of applicability for csi requirements for RedCap | 17.1.0 |
| 2022-12 | RAN#98 | R5-226690 | 0610 |  | F | Updating clause 3 and Annexes for RedCap | 17.1.0 |
| 2022-12 | RAN#98 | R5-227088 | 0612 |  | F | Correction to dl-DataToUL-ACK for PDSCH demod CA test cases | 17.1.0 |
| 2022-12 | RAN#98 | R5-227249 | 0616 |  | F | Update of test case 7.2.2.2.1\_3 | 17.1.0 |
| 2022-12 | RAN#98 | R5-227250 | 0617 |  | F | Correction of LTE-NR coexistence test case | 17.1.0 |
| 2022-12 | RAN#98 | R5-227330 | 0618 |  | F | Update on 9.4B.1.1 message content section | 17.1.0 |
| 2022-12 | RAN#98 | R5-227332 | 0619 |  | F | Update test requirement reference in PDCCH test cases | 17.1.0 |
| 2022-12 | RAN#98 | R5-227805 | 0587 | 1 | F | Update of SIB1 scheduling | 17.1.0 |
| 2022-12 | RAN#98 | R5-227651 | 0606 | 2 | F | Addition of applicability for requirements for RedCap | 17.1.0 |
| 2022-12 | RAN#98 | R5-227807 | 0609 | 1 | F | Addition of test case 6.2.1.1.1.1 1Rx FDD FR1 periodic CQI reporting under AWGN conditions for RedCap | 17.1.0 |
| 2022-12 | RAN#98 | R5-227808 | 0602 | 1 | F | Addition of NR-U PDSCH Demod test case | 17.1.0 |
| 2022-12 | RAN#98 | R5-227809 | 0591 | 1 | F | Addition of test case 6.2.2.1.1.4 for redcap | 17.1.0 |
| 2022-12 | RAN#98 | R5-227810 | 0592 | 1 | F | Addition of test case 6.2.2.1.2.4 for redcap | 17.1.0 |
| 2022-12 | RAN#98 | R5-227811 | 0603 | 1 | F | Addition of DL1024QAM FDD PDSCH test case | 17.1.0 |
| 2022-12 | RAN#98 | R5-227812 | 0604 | 1 | F | Addition of DL1024QAM TDD PDSCH test case | 17.1.0 |
| 2022-12 | RAN#98 | R5-227813 | 0596 | 1 | F | update to CQI CA test case | 17.1.0 |
| 2022-12 | RAN#98 | R5-227814 | 0594 | 1 | F | Extension of SA CA Demod and CSI test cases to NSA | 17.1.0 |
| 2022-12 | RAN#98 | R5-227815 | 0613 | 1 | F | Clarification of UL RMC in FR1 PMI test cases | 17.1.0 |
| 2022-12 | RAN#98 | R5-227642 | 0590 | 2 | F | FR2 PC1 Demod MU update | 17.1.0 |
| 2022-12 | RAN#98 | R5-227953 | 0582 | 1 | F | Update HST test case 5.2A.2.4 | 17.1.0 |
| 2022-12 | RAN#98 | R5-227954 | 0583 | 1 | F | Addition of TC 5.2A.3.4.1, 4RX PDSCH Demod Perf for HST-SFN CA | 17.1.0 |
| 2022-12 | RAN#98 | R5-227955 | 0584 | 1 | F | Addition of TC 5.2A.3.5.1, 4RX PDSCH Demod Perf for HST-DPS CA | 17.1.0 |
| 2022-12 | RAN#98 | R5-227956 | 0611 | 1 | F | HST test case 5.2A.2.5.1 | 17.1.0 |
| 2022-12 | RAN#98 | R5-227957 | 0595 | 1 | F | Extension of SDR 2CA test case for higher CA | 17.1.0 |
| 2022-12 | RAN#98 | R5-227991 | 0586 | 1 | F | Addition of Minimum Test time for PDCCH demodulation for power saving | 17.1.0 |
| 2022-12 | RAN#98 | R5-228035 | 0614 | 1 | F | Correction to searchSpaces in performance for power saving test cases | 17.1.0 |
| 2022-12 | RAN#98 | R5-228036 | 0620 | 1 | F | Update PowerSaving test cases | 17.1.0 |
| 2023-03 | RAN#99 | R5-230048 | 0621 | - | F | Correction to 2Rx TDD FR2 8.3.2.2.1 | 17.2.0 |
| 2023-03 | RAN#99 | R5-230057 | 0623 | - | F | Correction to the sub-title number of 6.2.2.1.1.4 | 17.2.0 |
| 2023-03 | RAN#99 | R5-230420 | 0626 | - | F | Editorial correction to 5.2A.2.4 and 5.2A.2.5 | 17.2.0 |
| 2023-03 | RAN#99 | R5-230682 | 0627 | - | F | Adding missing RMCs for HD-FDD | 17.2.0 |
| 2023-03 | RAN#99 | R5-230683 | 0628 | - | F | Minimum test time for HD-FDD RMCs for RedCap test cases | 17.2.0 |
| 2023-03 | RAN#99 | R5-230702 | 0629 | - | F | Addition of test case 5.2.2.1.17 2Rx FDD FR1 PDSCH performance for RedCap | 17.2.0 |
| 2023-03 | RAN#99 | R5-230703 | 0630 | - | F | Addition of test case 5.2.2.2.18 2Rx TDD FR1 PDSCH performance for RedCap | 17.2.0 |
| 2023-03 | RAN#99 | R5-230706 | 0632 | - | F | Addition of test case 5.2.1.2.1 1Rx TDD FR1 PDSCH performance for RedCap | 17.2.0 |
| 2023-03 | RAN#99 | R5-230707 | 0633 | - | F | Updates to test case 6.2.2.1.1.4 and 6.2.2.1.2.4 for redcap | 17.2.0 |
| 2023-03 | RAN#99 | R5-230717 | 0638 | - | F | Test tolerances for newly introduced RedCap test cases | 17.2.0 |
| 2023-03 | RAN#99 | R5-230724 | 0639 | - | F | Updates of applicability of requirements for RedCap | 17.2.0 |
| 2023-03 | RAN#99 | R5-230764 | 0640 | - | F | Introduction of PDSCH demodulation performance test cases with shared spectrum access | 17.2.0 |
| 2023-03 | RAN#99 | R5-230982 | 0643 | - | F | Correction to K1 settings in 6.2A.3.1.1 | 17.2.0 |
| 2023-03 | RAN#99 | R5-231220 | 0646 | - | F | Corrections on FR2 256QAM test case 7.2.2.2.1\_3 | 17.2.0 |
| 2023-03 | RAN#99 | R5-231221 | 0647 | - | F | Updates for Power Saving FR1 test cases | 17.2.0 |
| 2023-03 | RAN#99 | R5-231298 | 0649 | - | F | Update of FR2 PDSCH mapping type A performance test case | 17.2.0 |
| 2023-03 | RAN#99 | R5-231305 | 0650 | - | F | Update of Redcap test case | 17.2.0 |
| 2023-03 | RAN#99 | R5-231307 | 0651 | - | F | Correction of missing test applicability for FR2 PC1 | 17.2.0 |
| 2023-03 | RAN#99 | R5-231696 | 0636 | 1 | F | Updates to TT for PDSCH repetition test cases | 17.2.0 |
| 2023-03 | RAN#99 | R5-231697 | 0631 | 1 | F | Updates to test case 5.2.1.1.1 1Rx FDD FR1 PDSCH performance for RedCap | 17.2.0 |
| 2023-03 | RAN#99 | R5-231698 | 0645 | 1 | F | Update of HST DPS TCs | 17.2.0 |
| 2023-03 | RAN#99 | R5-231699 | 0648 | 1 | F | Updates for Power Saving FR2 test case | 17.2.0 |
| 2023-03 | RAN#99 | R5-231841 | 0624 | 1 | F | Updates to HST test case 5.2A.3.4.1 | 17.2.0 |
| 2023-03 | RAN#99 | R5-231842 | 0625 | 1 | F | Updates to HST test case 5.2A.3.5.1 | 17.2.0 |
| 2023-03 | RAN#99 | R5-231848 | 0644 | 1 | F | Correction to test point 1-7 in 5.2.2.1.1\_1 | 17.2.0 |
| 2023-03 | RAN#99 | R5-231877 | 0622 | 1 | F | Correction to periodic CQI reporting with Table 3 cases 6.2.2.1.1.2, 6.2.2.2.1.2, 6.2.3.1.1.2 and 6.2.3.2.1.2 | 17.2.0 |
| 2023-03 | RAN#99 | R5-231883 | 0652 | 1 | F | Update to URLLC CQI test cases | 17.2.0 |
| 2023-03 | RAN#99 | R5-231985 | 0635 | 2 | F | Updates to random precoder configuration for PDSCH/PDCCH requirements | 17.2.0 |
| 2023-03 | RAN#99 | R5-231986 | 0637 | 2 | F | Clarification to Annex B.3 for HST-SFN and HST-DPS models | 17.2.0 |
| 2023-03 | RAN#99 | R5-231877 | 0622 | 1 | F | addition of missing changes of this CR | 17.2.1 |
| 2023-03 | RAN#99 | R5-231883 | 0652 | 1 | F | addition of missing clause G.4.3a and other changes of this CR | 17.2.1 |
| 2023-06 | RAN#100 | R5-232384 | 0653 | - | F | Correction of Table F.1.1.3 additional 4Tx uncertainty | 17.3.0 |
| 2023-06 | RAN#100 | R5-232570 | 0659 | - | F | Core spec alignment for applicability of requirements | 17.3.0 |
| 2023-06 | RAN#100 | R5-232571 | 0660 | - | F | Updates to test case 6.2.1.1.1.1, 1Rx FDD FR1 periodic CQI reporting under AWGN conditions for RedCap | 17.3.0 |
| 2023-06 | RAN#100 | R5-232572 | 0661 | - | F | Addition of test case 6.2.1.2.1.1, 1Rx TDD FR1 periodic CQI reporting under AWGN conditions for RedCap | 17.3.0 |
| 2023-06 | RAN#100 | R5-232573 | 0662 | - | F | Addition of test case 6.2.1.2.2.1, 1Rx TDD FR1 periodic wideband CQI reporting under fading conditions for RedCap | 17.3.0 |
| 2023-06 | RAN#100 | R5-232577 | 0665 | - | F | Missing minimum test time for reference channel for RedCap | 17.3.0 |
| 2023-06 | RAN#100 | R5-232809 | 0667 | - | F | Addition of Applicability of different requirements for HST | 17.3.0 |
| 2023-06 | RAN#100 | R5-232810 | 0668 | - | F | Update of Reference measurement channels for SCS 15 kHz FR1 | 17.3.0 |
| 2023-06 | RAN#100 | R5-232811 | 0669 | - | F | Update of Reference measurement channels for SCS 30 kHz FR1 | 17.3.0 |
| 2023-06 | RAN#100 | R5-232835 | 0670 | - | F | Add applicability rule for PDSCH with inter cell interference and CRS-IM demodulation requirements | 17.3.0 |
| 2023-06 | RAN#100 | R5-232836 | 0671 | - | F | Adding FRC for R17 demodulation enhancement WI | 17.3.0 |
| 2023-06 | RAN#100 | R5-232858 | 0680 | - | F | Addition of PDSCH TC's for 3DLCA and 4DLCA with power imbalance | 17.3.0 |
| 2023-06 | RAN#100 | R5-232859 | 0681 | - | F | Addition of NR-DC SDR test case | 17.3.0 |
| 2023-06 | RAN#100 | R5-232863 | 0683 | - | F | Corrections to clause 5.5 SDR test cases | 17.3.0 |
| 2023-06 | RAN#100 | R5-232864 | 0684 | - | F | Corrections to Annex A.3.2\_1.2 | 17.3.0 |
| 2023-06 | RAN#100 | R5-233005 | 0693 | - | F | Correction to Candidate CCEs in 5.5A.1.1 | 17.3.0 |
| 2023-06 | RAN#100 | R5-233006 | 0694 | - | F | Correction to K1 settings in 5.5A.1.1 | 17.3.0 |
| 2023-06 | RAN#100 | R5-233007 | 0695 | - | F | Correction to message exception in 6.2A.3.1.1 | 17.3.0 |
| 2023-06 | RAN#100 | R5-233008 | 0696 | - | F | Correction to K1 settings in 6.2A.3.1.1 | 17.3.0 |
| 2023-06 | RAN#100 | R5-233041 | 0699 | - | F | Addition of test applicability of HST-SFN Scheme A and B | 17.3.0 |
| 2023-06 | RAN#100 | R5-233051 | 0709 | - | F | Addition of propagation information of HST scheme A and B | 17.3.0 |
| 2023-06 | RAN#100 | R5-233580 | 0676 | 1 | F | Addition of Demodulation performance testcases for PDSCH with inter-cell interference | 17.3.0 |
| 2023-06 | RAN#100 | R5-233581 | 0677 | 1 | F | Addition of Demodulation performance testcases for PDSCH with intra-cell inter user interference | 17.3.0 |
| 2023-06 | RAN#100 | R5-233582 | 0678 | 1 | F | Addition of Demodulation performance testcases for PDSCH CRS interference mitigation under NR-LTE coexistence | 17.3.0 |
| 2023-06 | RAN#100 | R5-233583 | 0679 | 1 | F | Addition of Demodulation performance testcases for PDSCH with inter-cell CRS interference | 17.3.0 |
| 2023-06 | RAN#100 | R5-233584 | 0688 | 1 | F | Additional test case 5.3.2.1.5 2RX FDD Minimum requirements for PDCCH with intra-slot repetition | 17.3.0 |
| 2023-06 | RAN#100 | R5-233585 | 0689 | 1 | F | Additional test case 5.3.2.2.5 2RX TDD Minimum requirements for PDCCH with intra-slot repetition | 17.3.0 |
| 2023-06 | RAN#100 | R5-233586 | 0690 | 1 | F | Additional test case 5.3.3.1.4 4RX FDD Minimum requirements for PDCCH with intra-slot repetition | 17.3.0 |
| 2023-06 | RAN#100 | R5-233587 | 0691 | 1 | F | Additional test case 5.3.3.2.4 4RX TDD Minimum requirements for PDCCH with intra-slot repetition | 17.3.0 |
| 2023-06 | RAN#100 | R5-233588 | 0700 | 1 | F | Addition of 5.2.2.1.20 2Rx FDD HST-SFN Scheme A | 17.3.0 |
| 2023-06 | RAN#100 | R5-233589 | 0701 | 1 | F | Addition of 5.2.2.1.21 2Rx FDD HST-SFN Scheme B | 17.3.0 |
| 2023-06 | RAN#100 | R5-233590 | 0702 | 1 | F | Addition of 5.2.2.2.21 2Rx TDD HST-SFN Scheme A | 17.3.0 |
| 2023-06 | RAN#100 | R5-233591 | 0703 | 1 | F | Addition of 5.2.2.2.22 2Rx TDD HST-SFN Scheme B | 17.3.0 |
| 2023-06 | RAN#100 | R5-233592 | 0704 | 1 | F | Addition of 5.2.3.1.19 4Rx FDD HST-SFN Scheme A | 17.3.0 |
| 2023-06 | RAN#100 | R5-233593 | 0705 | 1 | F | Addition of 5.2.3.1.20 4Rx FDD HST-SFN Scheme B | 17.3.0 |
| 2023-06 | RAN#100 | R5-233594 | 0706 | 1 | F | Addition of 5.2.3.2.20 4Rx TDD HST-SFN Scheme A | 17.3.0 |
| 2023-06 | RAN#100 | R5-233595 | 0707 | 1 | F | Addition of 5.2.3.2.21 4Rx TDD HST-SFN Scheme B | 17.3.0 |
| 2023-06 | RAN#100 | R5-233596 | 0708 | 1 | F | Addition of RMC for HST-SFN scheme A and B | 17.3.0 |
| 2023-06 | RAN#100 | R5-233597 | 0710 | 1 | F | Addition of MU and TT for HST scheme A and B | 17.3.0 |
| 2023-06 | RAN#100 | R5-233598 | 0656 | 1 | F | Addition of test case 5.3.2.1.4, 2Rx FDD FR1 PDCCH performance for RedCap | 17.3.0 |
| 2023-06 | RAN#100 | R5-233599 | 0664 | 1 | F | Addition on MU and TT for newly introduced RedCap CQI test cases | 17.3.0 |
| 2023-06 | RAN#100 | R5-233600 | 0685 | 1 | F | Addition of TDD FR1 single carrier CQI reporting test cases on band with shared spectrum access | 17.3.0 |
| 2023-06 | RAN#100 | R5-233601 | 0712 | 1 | F | Corrections on general sections for RF performance requirements | 17.3.0 |
| 2023-06 | RAN#100 | R5-233602 | 0692 | 1 | F | Update of Noc levels for n259 or PC2 | 17.3.0 |
| 2023-06 | RAN#100 | R5-233603 | 0713 | 1 | F | Corrections on the applicability of demodulation performance requirements | 17.3.0 |
| 2023-06 | RAN#100 | R5-233688 | 0711 | 1 | F | Addition of minimum test time for HST scheme A and B | 17.3.0 |
| 2023-06 | RAN#100 | R5-233707 | 0672 | 1 | F | Add PDSCH demodulation test case with inter-cell interference 2Rx FDD | 17.3.0 |
| 2023-06 | RAN#100 | R5-233708 | 0673 | 1 | F | Add PDSCH demodulation test case with inter-cell interference 4Rx FDD | 17.3.0 |
| 2023-06 | RAN#100 | R5-233714 | 0663 | 1 | F | Addition on MU and TT for newly introduced RedCap Demod test cases | 17.3.0 |
| 2023-06 | RAN#100 | R5-233732 | 0674 | 1 | F | Updates to 10^-5 BLER PDSCH Demodulation test cases | 17.3.0 |
| 2023-06 | RAN#100 | R5-233737 | 0675 | 1 | F | Updates to Power Saving test cases | 17.3.0 |
| 2023-06 | RAN#100 | R5-233743 | 0698 | 1 | F | Editorial correction to chapter 5 with move of 5.2.2.2.18 | 17.3.0 |
| 2023-06 | RAN#100 | R5-233745 | 0657 | 1 | F | Addition of test case 5.3.2.2.4, 2Rx TDD FR1 PDCCH performance for RedCap | 17.3.0 |
| 2023-06 | RAN#100 | R5-233746 | 0658 | 1 | F | Adding SNR value for test 1-4 in test case 5.2.1.1.1 | 17.3.0 |
| 2023-06 | RAN#100 | R5-233770 | 0715 | 1 | F | Correction to reportQuantity value for 1Tx URLLC CQI test cases | 17.3.0 |
| 2023-06 | RAN#100 | R5-233772 | 0682 | 2 | F | Updates to PDSCH Performance Test cases for 1024QAM | 17.3.0 |
| 2023-06 | RAN#100 | R5-233774 | 0687 | 1 | F | Correction to reportQuantity value for 1Tx CQI CA test cases | 17.3.0 |
| 2023-09 | RAN#101 | R5-234230 | 0717 | - | F | HST FR2 4.5.3.2 Noc for NR operating bands in FR2 | 17.4.0 |
| 2023-09 | RAN#101 | R5-234276 | 0720 | - | F | Addition of MU/TT analysis for 5.2.2.2.15, 5.2.3.2.15, 5.2A.2.3, 5.2A.3.3 | 17.4.0 |
| 2023-09 | RAN#101 | R5-234277 | 0721 | - | F | Addition of MU/TT analysis for 6.2.2.2.1.3, 6.2.3.2.1.3 | 17.4.0 |
| 2023-09 | RAN#101 | R5-234278 | 0722 | - | F | Updates to Clauses 6.2.2.2.1.3.3 and 6.2.3.2.1.3.3 | 17.4.0 |
| 2023-09 | RAN#101 | R5-234279 | 0723 | - | F | Addition of Redcap applicability clause 7 and 8 | 17.4.0 |
| 2023-09 | RAN#101 | R5-234280 | 0724 | - | F | Corrections to Annex A.4 Table A.4-1 | 17.4.0 |
| 2023-09 | RAN#101 | R5-234282 | 0726 | - | F | Addition of 1024QAM CQI tests 6.2.2.1.1.3, 6.2.2.2.1.4, 6.2.3.1.1.3, 6.2.3.2.1.4 | 17.4.0 |
| 2023-09 | RAN#101 | R5-234286 | 0729 | - | F | Update to PDSCH repetition test cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-234291 | 0732 | - | F | Addition of min test time procedure to Annex G | 17.4.0 |
| 2023-09 | RAN#101 | R5-234548 | 0737 | - | F | Removing brackets for SNR in test case 5.2.1.2.1 | 17.4.0 |
| 2023-09 | RAN#101 | R5-234550 | 0738 | - | F | Addition of test case 5.3.1.1.1, 1Rx FDD FR1 PDCCH performance for RedCap | 17.4.0 |
| 2023-09 | RAN#101 | R5-234824 | 0741 | - | F | Addition of CQI test case 6.2.2.2.2.4, 2Rx TDD FR1 periodic wideband CQI reporting under fading conditions for RedCap | 17.4.0 |
| 2023-09 | RAN#101 | R5-234825 | 0742 | - | F | Addition on MU and TT for newly introduced RedCap Demod and CQI test cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-234916 | 0745 | - | F | Correction to 2Rx FR1 Periodic CQI reporting for RedCap | 17.4.0 |
| 2023-09 | RAN#101 | R5-235021 | 0749 | - | F | Update PDSCH Reference Channel and mTT for CA scenarios | 17.4.0 |
| 2023-09 | RAN#101 | R5-235145 | 0750 | - | F | Editorial correction of HST-SFN Scheme A test cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-235252 | 0752 | - | F | Correction to title of 5.2.3.2.11\_1 | 17.4.0 |
| 2023-09 | RAN#101 | R5-235256 | 0754 | - | F | Correction to REG bundle size in 5.3.2.2.5 | 17.4.0 |
| 2023-09 | RAN#101 | R5-235686 | 0736 | 1 | F | Updates to existing RedCap Demod and CQI test cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-235687 | 0739 | 1 | F | Addition of test case 5.3.1.2.1, 1Rx TDD FR1 PDCCH performance for RedCap | 17.4.0 |
| 2023-09 | RAN#101 | R5-235688 | 0740 | 1 | F | Addition of CQI test case 6.2.2.2.1.5, 2Rx TDD FR1 periodic CQI reporting under AWGN conditions for RedCap | 17.4.0 |
| 2023-09 | RAN#101 | R5-235689 | 0743 | 1 | F | Correction to 2Rx FR1 PDSCH and PDCCH performance for RedCap | 17.4.0 |
| 2023-09 | RAN#101 | R5-235690 | 0744 | 1 | F | Correction to REG bundle size for PDCCH performance test cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-235691 | 0734 | 1 | F | Addition of missing RMCs for RedCap PDCCH Test Case | 17.4.0 |
| 2023-09 | RAN#101 | R5-235692 | 0728 | 1 | F | Addition of MU/TT analysis for 5.2.2.1.16, 5.2.2.2.17, 5.2.3.1.16, 5.2.3.2.17 | 17.4.0 |
| 2023-09 | RAN#101 | R5-235693 | 0746 | 1 | F | Correction to reference of connection diagram for SDR test cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-235694 | 0748 | 1 | F | Alignment to core spec for PDCCH test cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-235871 | 0719 | 1 | F | Update to NR-U demod test cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-235872 | 0718 | 1 | F | Correction to measurement channel table for redcap CQI cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-235873 | 0725 | 1 | F | Addition of 1024QAM SDR single carrier and carrier aggregation tests | 17.4.0 |
| 2023-09 | RAN#101 | R5-235874 | 0727 | 1 | F | Addition of MU/TT analysis for 5.2.2.1.1\_3, 5.2.2.2.1\_3, 5.2.3.1.1\_5, 5.2.3.2.1\_5 | 17.4.0 |
| 2023-09 | RAN#101 | R5-235876 | 0716 | 1 | F | Correction to Annex B.2 for 1024QAM related TDLD Delay profile | 17.4.0 |
| 2023-09 | RAN#101 | R5-235877 | 0731 | 1 | F | Update to FR2 Demod CA test cases for Agg BW upto 400MHz | 17.4.0 |
| 2023-09 | RAN#101 | R5-235878 | 0733 | 1 | F | Addition of NR-DC Demod and CSI test cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-235879 | 0747 | 1 | F | Correction to Candidate CCEs for SDR test cases | 17.4.0 |
| 2023-09 | RAN#101 | R5-235880 | 0753 | 1 | F | Update to NSA FR1 and FR2 SDR test cases | 17.4.0 |
| 2023-09 | RAN#101 | - | - | - | - | Administrative release upgrade to match the release of 3GPP TS 38.522 which was upgraded at RAN#101 to Rel-18 due to Rel-18 relevant CR(s) | 18.0.0 |
| 2023-12 | RAN#102 | R5-236247 | 0756 | - | F | Removal of technical content in TS 38.521-4 v17.4.0 and substitution with pointer to the next Release | 18.1.0 |
| 2023-12 | RAN#102 | R5-236288 | 0757 | - | F | Addition of MMSE-IRC CQI reporting test case with FDD 2Rx | 18.1.0 |
| 2023-12 | RAN#102 | R5-236290 | 0758 | - | F | Correction on the test applicability rules for MMSE-IRC test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-236511 | 0759 | - | F | Addition of test case 6.4.2.1.1, 2Rx FDD FR1 RI reporting for RedCap | 18.1.0 |
| 2023-12 | RAN#102 | R5-236512 | 0760 | - | F | Addition of test case 6.4.2.2.1, 2Rx TDD FR1 RI reporting for RedCap | 18.1.0 |
| 2023-12 | RAN#102 | R5-236513 | 0761 | - | F | Editorial, incorrect header level in 6.2.2.1.2.4.3 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236514 | 0762 | - | F | MU ad TT values for newly introduced RedCap test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-236515 | 0763 | - | F | Correction of CQI index table | 18.1.0 |
| 2023-12 | RAN#102 | R5-236518 | 0764 | - | F | Correction of K0 in CA CQI reporting test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-236628 | 0765 | - | F | Updating to FR2 PDSCH repetition test case 7.2.2.2.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236629 | 0766 | - | F | Updating to applicability section 7.1.1.3 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236630 | 0767 | - | F | Updating to FR1 PDSCH repetition test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237212 | 0777 | - | F | Update on 6.2.2.2.1.5 test case | 18.1.0 |
| 2023-12 | RAN#102 | R5-237215 | 0779 | - | F | Update in TDD LTE-NR coexistence test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237286 | 0782 | - | F | Update test procedure for FR1 CA Demod cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237287 | 0783 | - | F | Add R.PDCCH.1-1.2 FDD and R.PDCCH.2-1.5 to Table G.1.5-2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237288 | 0784 | - | F | Add R.PDCCH.2-1.5 and R.PDCCH.2-1.6 to Annex G | 18.1.0 |
| 2023-12 | RAN#102 | R5-237291 | 0787 | - | F | Correction to measurement channel table for redcap CQI test 6.2.2.2.2.4 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237468 | 0788 | 1 | F | Correction to reportQuantity for 1Tx CQI tests for URLLC cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237474 | 0789 | 1 | F | Correction to reportQuantity for 1Tx CQI tests for CA CSI test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237696 | 0781 | 1 | F | Update to DL1024QAM PDSCH test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237699 | 0771 | 1 | F | Editorial correction to NR Demod enhancement TCs | 18.1.0 |
| 2023-12 | RAN#102 | R5-237700 | 0780 | 1 | F | Editorial correction in test cases 6.3.2.1.5 and 6.3.2.1.6 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237819 | 0769 | 1 | F | Editorial correction to 2Rx PDSCH Demod Requirements TCs | 18.1.0 |
| 2023-12 | RAN#102 | R5-237820 | 0770 | 1 | F | Editorial correction to 4Rx PDSCH Demod Requirements TCs | 18.1.0 |
| 2023-12 | RAN#102 | R5-237829 | 0768 | 1 | F | Editorial correction to R17 HST DPS/SFN TCs | 18.1.0 |
| 2023-12 | RAN#102 | R5-237832 | 0772 | 1 | F | Demod additional test case for 6.3.2.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237850 | 0785 | 1 | F | Addition of SDR test case for RedCap | 18.1.0 |
| 2023-12 | RAN#102 | R5-237851 | 0773 | 1 | F | Demod additional test case for 6.3.2.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237852 | 0774 | 1 | F | Demod additional test case for 6.3.3.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237853 | 0775 | 1 | F | Demod additional test case for 6.3.3.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237932 | 0790 | 1 | F | Update to FR1 PDSCH with inter-cell interference test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237934 | 0776 | 1 | F | Update for 38.521-4 Annex | 18.1.0 |
| 2023-12 | RAN#102 | R5-237941 | 0778 | 1 | F | Addition of new PDSCH Reference Channel TDD to cover FR2 PDCCH Test 2-2 | 18.1.0 |
| 2024-03 | RAN#103 | R5-240218 | 0791 | - | F | Corrections to test parameters for CSI test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-240827 | 0800 | - | F | Correction of TT for RedCap demod test case 5.3.2.1.4 and 5.3.2.2.4 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240864 | 0803 | - | F | Addition of Measurement uncertainty for Redcap PDSCH demodulation test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-240877 | 0804 | - | F | Update on test case 7.5.1 to add FR2 testing direction | 18.2.0 |
| 2024-03 | RAN#103 | R5-241113 | 0805 | - | F | Correction to 1Rx FR1 PDSCH and PDCCH performance for RedCap | 18.2.0 |
| 2024-03 | RAN#103 | R5-241141 | 0809 | - | F | Addition of FR2 SDR test for RedCap | 18.2.0 |
| 2024-03 | RAN#103 | R5-241142 | 0810 | - | F | Addition of 6.2.1.1.2.1 test for RedCap | 18.2.0 |
| 2024-03 | RAN#103 | R5-241143 | 0811 | - | F | Update incorrect reference to SDR test in Table 5.1.1.11-1 for RedCap | 18.2.0 |
| 2024-03 | RAN#103 | R5-241145 | 0813 | - | F | Update to power imbalance test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241146 | 0814 | - | F | Correction to RMC name in Table A.3.2.2.2-29 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241157 | 0818 | - | F | HST-DPS channel profile clarifications | 18.2.0 |
| 2024-03 | RAN#103 | R5-241170 | 0820 | - | F | Correction to FR2 SDR requirements | 18.2.0 |
| 2024-03 | RAN#103 | R5-241171 | 0821 | - | F | Correction to FR2 256QAM CQI reporting | 18.2.0 |
| 2024-03 | RAN#103 | R5-241175 | 0823 | - | F | Correction RedCap CSI Test Case message exceptions | 18.2.0 |
| 2024-03 | RAN#103 | R5-241370 | 0824 | - | F | Editorial correction to 5.2.2.1.1\_1 Modulation format | 18.2.0 |
| 2024-03 | RAN#103 | R5-241684 | 0807 | 1 | F | Update Es for 1024QAM scenarios | 18.2.0 |
| 2024-03 | RAN#103 | R5-241811 | 0792 | 1 | F | Addition of MMSE-IRC CQI reporting test case with FDD 4Rx | 18.2.0 |
| 2024-03 | RAN#103 | R5-241812 | 0793 | 1 | F | Addition of MMSE-IRC CQI reporting test case with TDD 2Rx | 18.2.0 |
| 2024-03 | RAN#103 | R5-241813 | 0794 | 1 | F | Addition of MMSE-IRC CQI reporting test case with TDD 4Rx | 18.2.0 |
| 2024-03 | RAN#103 | R5-241814 | 0795 | 1 | F | Completion of MMSE-IRC CQI reporting test case with FDD 2Rx | 18.2.0 |
| 2024-03 | RAN#103 | R5-241815 | 0816 | 1 | F | Update to FR1 PDSCH inter-cell interference test case | 18.2.0 |
| 2024-03 | RAN#103 | R5-241816 | 0817 | 1 | F | Update to FR1 PDSCH intra-cell interference test case | 18.2.0 |
| 2024-03 | RAN#103 | R5-241817 | 0798 | 1 | F | Addition of RedCap demod test case 6.3.1.2.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241818 | 0819 | 1 | F | Corrections to URLLC Test Cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241819 | 0806 | 1 | F | Addition of SDR RMC for more FDD channel BW | 18.2.0 |
| 2024-03 | RAN#103 | R5-241820 | 0825 | 1 | F | Correction to max throughput values for PDSCH RMC | 18.2.0 |
| 2024-03 | RAN#103 | R5-241821 | 0808 | 1 | F | Update to NR-U demod test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241822 | 0802 | 1 | F | Core spec alignment, addition of RMC and UL-DL configuration for NR-U | 18.2.0 |
| 2024-03 | RAN#103 | R5-241959 | 0796 | 1 | F | Adding measurement uncertainty and test tolerance for Demod PDCCH with intra-slot repetition test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241960 | 0797 | 1 | F | Addition of RedCap demod test case 6.3.1.1.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241961 | 0799 | 1 | F | Addition of RedCap demod test case 6.3.2.2.7 | 18.2.0 |
| 2024-03 | RAN#103 | R5-242019 | 0815 | 1 | F | Correction to RMC name in Table A.3.2.1.1-18 | 18.2.0 |